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APRIL 1st, 1943

*Greetings to the R.A.F.*

25th ANNIVERSARY

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The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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# The Outlook

## Between the Wars

IN the life of a human being the twenty-first birthday is the most important, marking as it does the attainment of "man's estate." In the case of the Royal Air Force, which to-day celebrates its twenty-fifth birthday, this latter anniversary has assumed far greater importance. This is natural because the R.A.F. is at war once more, as it was at its birth, and has achieved very special distinction and glory by its deeds. From the Battle of Britain to the present time the Royal Air Force has added chapter upon chapter to the glorious history which it began so valiantly in 1918. From being a relatively weak, though numerically strong arm it has become the country's most powerful striking force so far as the present war in Europe is concerned.

The Royal Air Force is the oldest of all separate air forces. Britain was the first great Power to conceive the idea of separating air power from the age-long services of the sea and the land, and the decision taken in 1918 has been most fruitful in results. Italy, Germany and some of the smaller countries followed suit later, but usually with different ideas and different results. Mussolini believed that the *Regia Aeronautica*, working with the Italian Navy (which, incidentally, had no aircraft carriers), would dominate the Mediterranean. It has not done so. The *Luftwaffe* worked splendidly with the German Army in Poland, Norway and France, but proved incapable of undertaking a successful bombing offensive against this country when divorced from its regular partner. The Royal Air Force has learnt to work with the other Services; in fact, has become indispensable to them, while being limited in the extent of its own independent operations only by the number of aircraft that can be spared from the ever-increasing demands of Navy and Army.

We have devoted the greater part of this week's issue to an account of the changes in organisation and equipment that have taken place during the years between the wars. Although this has entailed the omission or curtailing of many of our regular features, we feel that our readers will applaud this course. Many of those serving in the R.A.F. to-day are the sons of men who went into battle on the old and often very crude aircraft of the 1914-18 period, and we feel that they will take a very special interest in the somewhat quaint types on which their fathers won distinction.

## Technical Progress

A REVIEW of the more important aircraft and engine types produced between the wars discloses an amazing progress. From the 110 m.p.h. or so of the Sopwith Camel, and 130 m.p.h. of the S.E.5A, single-seater fighter we have reached the 400 m.p.h. mark. The armament has, of course, increased out of all recognition. But perhaps the most astounding fact of all is that to-day youngsters of twenty or so handle these modern projectiles as coolly and unperturbedly as did their fathers the low-powered fighters of 1918. That is due in no small measure to the much more thorough training which we now give our pilots before we pass them as fit for operational duties.

In the "heavy" bomber class, gross weight has grown from the 12,000 lb. of the Handley Page O/400 to the thirty tons of the Short Stirling, and the bomb load from about 1,000 lb. to eight tons. The corresponding speed figures are approximately 92 m.p.h. and 300 m.p.h. The O/400 was finished too late for bombing Berlin. The Stirlings, Halifaxes and Lancasters have repaired that omission.

Between these two extreme classes, the single-seater

fighter and the heavy bomber, a vast array of types have been produced, some in classes that were barely thought of in 1918, and all have contributed their quota to the march of progress.

Perhaps the most phenomenal advance has been made in the field of engine design and construction. Not only in the matter of power output and specific weight, but far more in reliability. Before the outbreak of the present war it was not unknown for a short-service officer to go through his entire service period without his squadron having a single forced landing due to engine failure. War risks are, of course, in a different category, but here, too, many lives of air crews have been saved by parachutes. In the 1914-18 war air crews were not supplied with parachutes!

In the space left available by paper supply limitations we have not been able to deal with *every* aspect of the between-the-wars period. For instance, the history of airships has had to be omitted. In any case, it is one of Government vacillation, missed opportunities and unfortunate disasters, and has had no effect upon the growth of the Royal Air Force from boyhood to maturity.

*Per Ardua ad Astra* was the motto chosen for the R.A.F. The following pages reveal something of the "efforts." The degree to which the R.A.F. is "reaching the stars" is being recorded daily in the Air Ministry's communiqués.

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## 25 YEARS AGO

# The King's Message to the Royal Air Force.

*To the Right Hon. Lord Weir, Secretary of State and President of the Air Council.*

IN this supreme hour of victory I send greetings and heartfelt congratulations to all ranks of the Royal Air Force. Our aircraft have been ever in the forefront of the battle; pilots and observers have consistently maintained the offensive throughout the ever-changing fortunes of the day, and in the war zones our gallant dead have lain always beyond the enemies' lines or far out to sea.

OUR far-flung squadrons have flown over home waters and foreign seas, the Western and Italian battle lines, Rhineland, the mountains of Macedonia, Gallipoli, Palestine, the plains of Mesopotamia, the forests and swamps of East Africa, the North-West frontier of India, and the deserts of Arabia, Sinai, and Darfur.

THE birth of the Royal Air Force, with its wonderful expansion and development, will ever remain one of the most remarkable achievements of the Great War.

EVERYWHERE, by God's help, officers, men and women of the Royal Air Force have splendidly maintained our just cause, and the value of their assistance to the Navy, the Army, and to Home Defence has been incalculable. For all their magnificent work, self-sacrifice, and devotion to duty, I ask you on behalf of the Empire to thank them.

*November 11th*, 1918

George R. I.

**The R.A.F. celebrates its twenty-fifth birthday to-day. We reproduce its first congratulatory message, received from the late King George V at the end of the 1914-18 war. The wording would be equally appropriate to-day. Our pages this week are devoted, almost entirely, to a review of the aircraft, engines and work of the Royal Air Force through its 25 years of devoted service to the nation.**

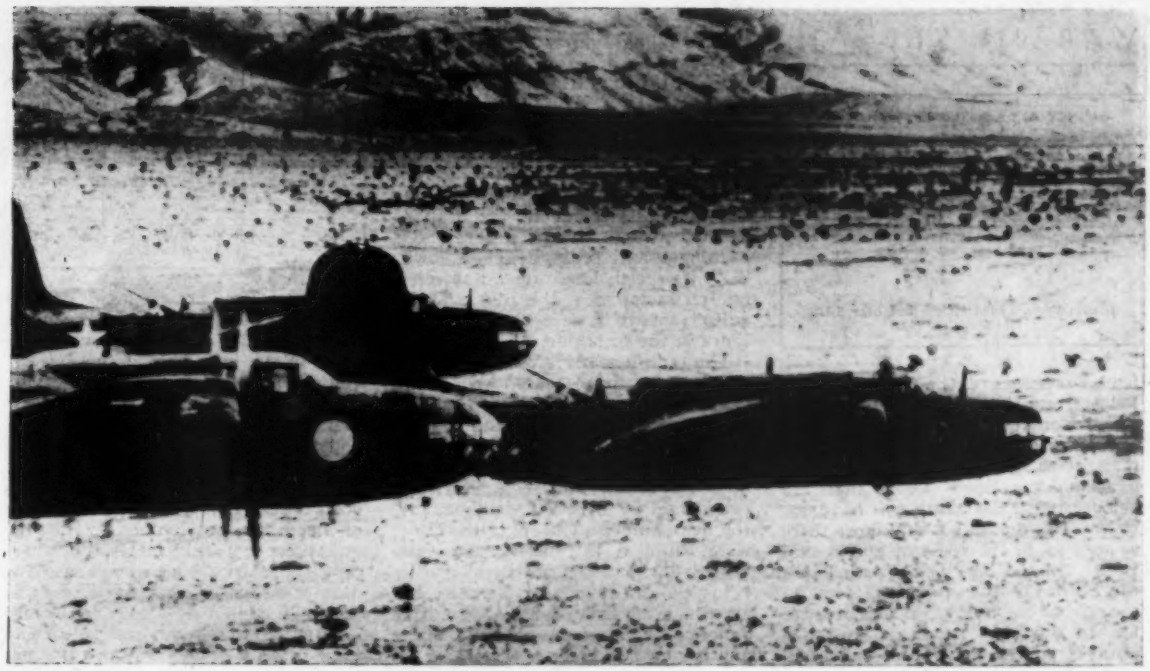
## Control Without—and with—Occupation

WHEN questions are asked in Parliament shortly about the taking over by the Ministry of Aircraft Production of all the shares in Short Brothers, it is very much to be hoped that Sir Stafford Cripps will not evade them by the Parliamentary phrase that "it is not in the National interest" that the country should be told.

It is inevitable that when the Minister of Aircraft Production appoints "controllers" of three firms (as he has now done) a certain stigma must attach to those firms. If these drastic steps were taken merely because the firm in question was lagging behind in production, the country should be informed. The enemy could hardly benefit from such knowledge since he probably has a pretty shrewd idea anyway.

There need be little surprise if a few firms have failed to reach peak production. Most of them have had to expand from very modest size into huge concerns (due to lack of foresight of successive Governments), and it would be surprising indeed if, with all the changes that have taken place, some had not been unequal to the extremely difficult task It is not even beyond the limits of possibility that the M.A.P. itself may have been to blame. Cases are not unknown of firms at first being prevented from expanding to the size they desired by M.A.P. and then being asked to expand to that size, or greater, in a much shorter time.

In the case of Short Brothers, we believe we are right in saying that when one of their factories was damaged by a direct hit they were instructed not to repair that factory but to transfer to another site, much against their will. After something like a year, the decision was rescinded, but by then much valuable time had been lost. The Stirling design is not, perhaps, very well suited to quantity production, but M.A.P. accepted it, and its technicians should have foreseen that it was likely to cause certain production difficulties.



Bostons of the U.S. Army Air Force in N. Africa, in close formation as they start off for their objective.

# WAR in the AIR

## *Air Offensive in Tunisia : German Raids on Britain : The Fighter Mosquito : American Air Victories*

WHILE the great battle, or rather battles, in Tunisia sways to and fro it would be futile for a weekly paper to attempt to chronicle each manœuvre or to draw any conclusions from the facts reported before it went to press. One thing is certain, namely that the opening of the battle was marked by an air bombardment on an absolutely unprecedented scale. The number of sorties made by both the Western Desert Air Force and the squadrons working in Tunisia added together beat even the record of the battle of Alamein. The bombing went on by night as well as by day, and while large numbers of squadrons went for the troops of the enemy, others plastered his airfields. Halifaxes and Wellingtons of the Western Desert made a special set at positions west of the Mareth Line, while further to the north U.S. Bostons assailed transport on the roads, and the explosion of their bombs lifted trucks bodily into the air and threw them aside into the ditches.

German fighters made more of a show than they have put up for some time past, but seemed unwilling to fight things out to a finish, and in the early days of the fighting no great numbers of machines were shot down on either side. Nevertheless, a broadcast announcer in Berlin stated on March 24th that "the indisputable air superiority of the Axis over the whole Tunisian area is remarkable," and he went on to say that the British and American Air Forces for some days past had contented themselves with attacking Italian towns and carrying out "terror raids." The last sentence is a distorted allusion to the activities of Malta, whose squadrons have been even busier than usual over Sicily, chiefly shooting up locomotives. The American Air Force which operates from farther to the east, and was previously reckoned as under the general orders of Gen. Alexander before he left the Middle East for North Africa, has also raided the port of Naples and the terminus of the train ferry at Messina. So has the R.A.F.

### Nearer Home

LAST week Bomber Command sent about 300 machines, all of the four-engined class, to carry still further the destruction already wrought at St. Nazaire. Only one bomber was lost, which seems very remarkable. It suggests that the defences were not anything like so strong as they have often been found round the U-boat bases. No doubt the battles in Tunisia have made the Germans withdraw what forces they felt they could spare from other fronts, and these would include night fighters and A.A. guns. Still it is hard to believe that they would make any serious reduction in the defences of their Atlantic bases for U-boats, for it is on the U-boat that their last lingering hopes of victory depend. At the same time one wonders how they contrive to go on using a place like St. Nazaire or Lorient after the damage done to both by Bomber Command and the American Air Force. One can understand that the concrete pens in which the submarines are serviced are so strong that even direct hits by heavy bombs do not wreck the precious craft inside; but every facility for carrying on work must, one would think, have been so disorganised by the bombing that it would scarcely be possible to continue the repair work. Yet it seems to be carried out, somehow or other.

The Germans continue to reply to the heavy blows of Bomber Command with continuous tip-and-run raids by

## WAR IN THE AIR

**ENEMY AIR LOSSES to MARCH 27th**

| | Over G.B. | Over Continent | Middle East |
|---|---|---|---|
| Mar. 21 | 0 | 0 | 0 |
| " 22 | 1 | 2 | 0 |
| " 23 | 1 | 0 | 2 |
| " 24 | 11 | 0 | 0 |
| " 25 | 0 | 0 | 2 |
| " 26 | 0 | 1 | 0 |
| " 27 | 1 | 0 | 1 |
| | 14 | 3 | 5 |

Totals: West, 6,742; Middle East, over, 5,270; North Africa, 913.

fighter-bombers on the coast towns of Britain, and they occasionally venture up to Northumberland and Scotland. Perhaps they think that Fighter Command must now have its eyes so firmly fixed on the South Coast that the defence up in the North will have got slack. But raiders get shot down there as well as off the coast of Sussex and Kent. In the first 24 days of March the *Luftwaffe* lost 24 of its raiders, an average of one a day. Seven of these fell to our A.A. gunners, and one always rejoices to hear of successful shooting by them, although they admit themselves that their role in the struggle is not so much the destruction of raiders as breaking up their attempts, sometimes turning them back, and often pointing them out to the patrolling fighters.

### Fighter Mosquitoes

TO those in the know it came as no surprise that Fighter Mosquitoes would appear in action before long. This version of the famous De Havilland twin-engined wooden machine has made its début in the Bay of Biscay, where two Junkers 88s were met and promptly shot down. With its speed, long range, and other fine characteristics, the Fighter Mosquito is sure to be another very painful thorn in the Axis side.

The tank-buster Hurricane has been nicknamed the "can-opener" in North Africa, and recently it has been very successful in destroying or putting out of action a number of Axis tanks. Another interesting item of news from that theatre is that in a recent raid by U.S. Douglas bombers, the bomb-aimer members of the crews were supplied by the R.A.F. The probability is that the Britons were being allowed to gain practical experience in using some special pattern of American bomb sight. If so, it is yet another example of the way in which resources are being pooled by Britain and the United States, and may forecast the adoption of some highly efficient American bomb sight on British machines.

**BRITISH & U.S. AIR LOSSES to MARCH 27th**

| | Over G.B. A'crft. | Over Continent B'brs. | Over Continent F'trs. | Middle East A'crft. |
|---|---|---|---|---|
| Mar. 21 | 0 | 0 | 0 | 0 |
| " 22 | 0 | 4 | 0 | 0 |
| " 23 | 0 | 1 | 0 | 0 |
| " 24 | 0 | 0 | 1 | 0 |
| " 25 | 0 | 0 | 0 | 0 |
| " 26 | 0 | 4 | 2 | 0 |
| " 27 | 0 | 9 | 0 | 0 |
| | 0 | 18 | 3 | 0 |

Totals: West, 5,438; Middle East, about 2,086 North Africa, 380.

Sicily, which not so long ago was hoping to blot its little neighbouring island of Malta off the map as an element in the war, has lately been the victim of the aggressive spirit of the George Cross island. Up to March 21st the intruder aircraft from Malta had hit and put out of action no less than 105 locomotive engines in Sicily. It is a form of attack which causes a good deal of damage with a minimum of bloodshed, but it must restrict the quantities of warlike material destined for North Africa, and so will save the lives of Allied soldiers and airmen in the fighting in that area. In France locomotive works are now described as "priority" targets for Bomber Command.

Berlin received its heaviest raid to date on the night of March 27th, when R.A.F. four-engined bombers dropped over 900 tons.

## Here and There

### *Rolls' Greeting Card*

A GREETINGS card on which some 800 employees have written their signatures over a shadowy photograph of a Merlin engine has been sent to Air Chief Marshal Sir Charles Portal from Rolls Royce, Ltd., to mark the occasion of the R.A.F.'s 25th birthday.

### *Air Vice-Marshal Stedman Here*

THE Director-General of Air Research for the Royal Canadian Air Force, Air Vice-Marshal E. W. Stedman, is in this country visiting research and experimental establishments.

### *Atlantic Two-way Record*

CAPT. J. H. HART, of Pan-American Airways, has set up a record, it is believed, by crossing the Atlantic twice in one day. He and his crew are reported to have flown a Boeing flying-boat from Natal, Brazil, to a West African port and back in 23 hours 59 minutes.

### *"Glider Industry Stymied"*

SUCH is the heading to a paragraph in the latest issue of *American Aviation* to reach this country, which says that, "according to Capitol Hill sources," the U.S. Army Air Forces will shortly terminate glider training.

By quoting "Capitol Hill" the reader is invited to infer that the report comes straight from G.H.Q.—even from the White House itself—though it does not actually say so.

The paragraph goes on to say that the glider contractors cannot get the Army's approval to redesign their "ships," yet they are constantly being ordered to make one change after another and "there is serious questioning whether the airborne troop commands will even accept the ships, which would open the way for cancellation of contracts right and left."

Altogether it sounds like a first-class muddle.

### *Ten Years Old To-day*

THE R.A.F.'s Silver Jubilee naturally overshadows lessers birthdays, but its younger brother, the Indian Air Force, also celebrates its birthday, its tenth, to-day. On April 1st, 1933, the first flight of No. 1 Squadron India Air Force was formed at Karachi, and its personnel were six young Indians who had just returned from the R.A.F. College, Cranwell.

### *Australian Mission in London*

MR. CURTIN, Australia's Prime Minister, has announced the arrival in London of a mission which is to collect information on the production of aircraft suitable for Australia, and to speed up the supply of the necessary materials and machine-tools.

Senator Cameron, Minister of Aircraft Production, says that one result of the visit may be the concentration on Australian manufacture of standard types of British aircraft rather than experimental machines.

The mission consists of Mr. D. McVey, secretary of the Aircraft Production Department; Wing Cdr. L. J. Waskett, manager of the Commonwealth Aircraft Corporation; Group Capt. W. S. Armstrong, director of technical services in the R.A.A.F.; and Wing Cdr. J. P. Ryland.

### *R.A.F.'s Birthday Honour*

IN celebration of the R.A.F.'s 25th birthday, a King's Guard drawn from the R.A.F. Regiment to-day enjoyed the honour of mounting guard at Buckingham Palace, taking over from the Coldstream Guards.

It will be on duty for 48 hours, and will be relieved on Saturday by a second King's Guard drawn from another unit of the R.A.F. Regiment, which will also do 48 hours before handing over on Monday next to the Grenadiers.

### *Very Much Alive*

THE list of some 500 names of Russian scientists, engineers and inventors who have recently been awarded "Stalin Prizes" for outstanding work, contains a great many aircraft designers and aeronautical research workers.

Chief among these is the name of A. N. Tupolev, Associate Member of the Academy of Science, who designed (among other aircraft) the famous ANT-25 long-range monoplane.

Curiously enough, Tupolev was reported to have been included in the Soviet "purge" of a year or so before the war, but he is evidently very much alive and still doing good work.

### *Rotating Wing Aircraft*

THE second instalment of the article on "Rotating Wing Aircraft" will appear in next week's issue of *Flight*, April 8th.

THEN AND NOW : (On the left) the F.E.2B night bomber (120 h.p.) of the last war and (above) the Lancaster (4,700 h.p.) of the present time.

# A Review of Types Which Made History During the Years Between the Wars

*(Illustrated by "Flight" photographs)*

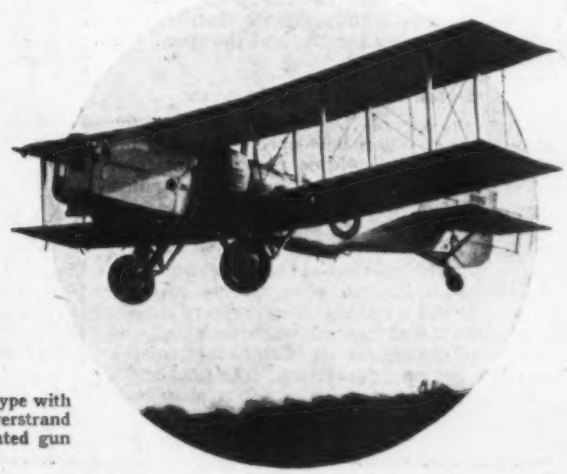
WHEN the Royal Air Force came into being on April 1st, 1918, aircraft design had but recently emerged from the compromise stage. By that is meant that, until the end of 1916 or so, the types of aircraft employed on various duties were for the greater part plain flying machines designed originally with no thought to military requirements other than that of simple, straightforward reconnaissance. Operational conditions soon forced upon designers the need for armament of various sorts, and until the latter part of 1916 such equipment had perforce to be added to the machines as an "afterthought."

During the two years that lay between the end of 1916 and the merging of the Royal Flying Corps and the Royal Naval Air Service into the Royal Air Force, specialised military designs had gone into production and were in operation. That the manufacturing concerns had not been idle is shown by the somewhat surprising fact that in October, 1918, the Royal Air Force possessed, as Lord Weir of Eastwood put it in a lecture to the North-East Coast Institution of Engineers and Shipbuilders, "over 22,000 effective machines." That figure would, of course, include trainers, but even so it is impressive.

It will be of interest to review briefly the types of aircraft in use when the Royal Air Force came into being. They were divided into classes, the names of which reveal the strategical conceptions of those days. The classes were:—

Single-seater fighters; two-seater fighters; single- and twin-engined day bombers (short- and long-distance); single-, twin- and multi-engined night bombers (short- and long-range); ground fighters and trainers.

These classes had been in general use by the R.F.C. The R.N.A.S. had been using any types they could get hold of, and classification there was consequently less rigid.



The Blackburn Skua (above) is a two-seater dive bomber-fighter type with Perseus engine. (On the right) is the Boulton and Paul Overstrand bomber, which was the first type to be fitted with power-operated gun turret in the nose.

# R.A.F. AIRCRAFT, 1918-1943

The single-seater fighter type built in the greatest numbers was probably the Sopwith Camel. Since the Sopwith firm grew into the Hawker Engineering Co., and in more recent years into the Hawker Aircraft Co., the Hurricane fighter can be said to be a direct descendant of the old Camel. The name Camel, by the way, originated as a nickname from the fact that the top of the fuselage was somewhat "humped" to give the pilot a better view.

### Single-seater Fighters

Descended from the famous little Sopwith Pup, the Camel was an equal-span biplane in which the top plane was straight while the lower had a pronounced dihedral angle. Stability had been sacrified deliberately in order to give good manœuvrability. The engine was a rotary, mostly 130 h.p. Clerget, and the armament of the standard type was two machine guns firing through the airscrew. A modified version used as a ship plane fighter had a 150 h.p. B.R.1 rotary engine, and carried but a single gun. The maximum speed of the Clerget-engined version was 113 m.p.h at 10,000ft., and it would climb to 10,000ft. in 12 minutes. The weight was 1,524 lb., and the wing span 28ft. In other words, this successful single-seater fighter was about the weight of a D.H. Moth!

The single-seater fighter which shared with the Camel the honours of being mostly widely used towards the end of the war was the S.E.5A, a design by the Royal Aircraft Factory (now Establishment) of Farnborough. It was built in large quantities by numerous sub-contracting firms. The S.E.5A had a 200 h.p. Hispano Suiza engine, built by the Wolseley company as the Viper. The flat radiator was in the nose, in front of the engine, and the machine gun was mounted on a rail which ran up over the top plane. It was an equal-span biplane of 26ft. 9in. span and weighed about 2,000 lb. The speed was 132 m.p.h. at 6,500ft.

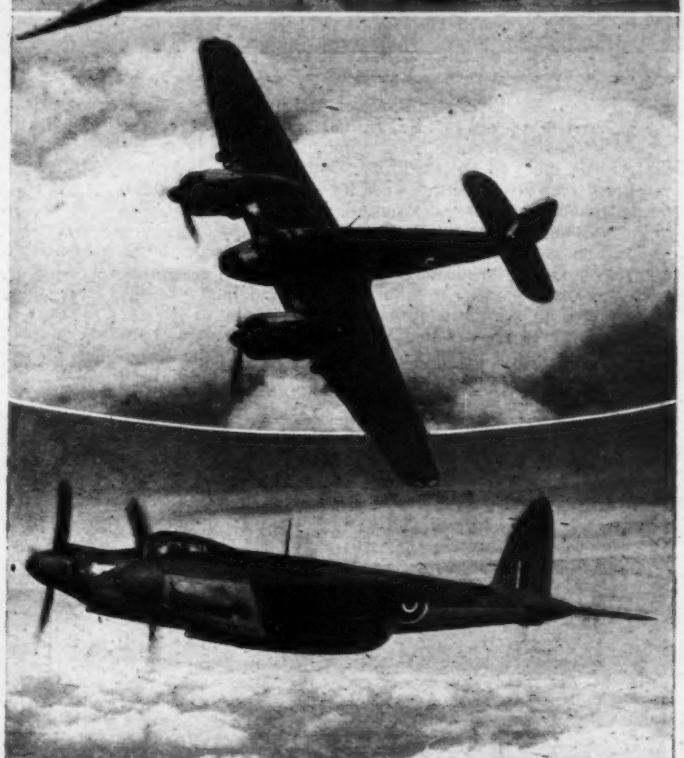
Pilots were by no means unanimous in their opinions of the Camel and the S.E.5A, the former being unstable but very light and manœuvrable and the other faster, stable and slightly less manœuvrable.

Successor to the Camel was the Sopwith Snipe, also with a rotary engine (B.R. 2 of 200 h.p.). It was a larger machine than the Camel (span 31ft.) and had two-bay wing bracing. The weight was slightly greater than that of the S.E.5A, viz., 2,130 lb., and the speed was 121 m.p.h. at 10,000ft.

### Defended Reconnaissance

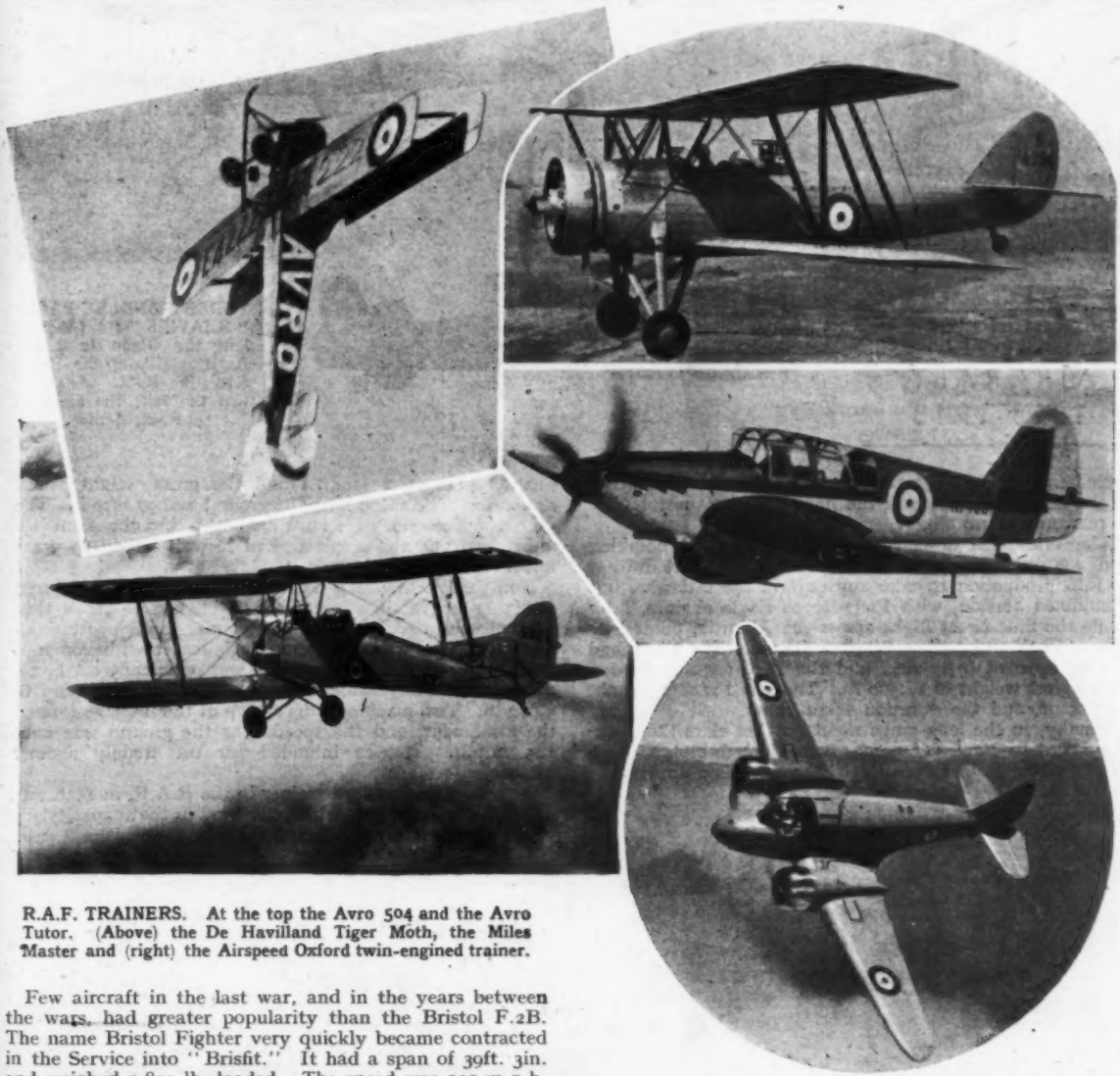
From the use of the original machines for reconnaissance there developed a demand for two-seaters which could do reconnaissance and at the same time defend themselves against enemy fighters. Of these two-seaters there were two in particular which were in extensive use: the Sopwith 1½-strutter and the Bristol F.2B.

The Sopwith 1½-strutter was so-called from its somewhat unusual wing bracing arrangement. It had a 130 h.p. Clerget rotary engine. The pilot sat well forward, where he had a good view, and the gunner aft of the wings, with a machine gun on a Scarff ring. The pilot had a fixed machine gun with synchronising gear. The type had rather disappeared from the R.F.C. at the time of the amalgamation, but was still used by the R.N.A.S.



**TWO-SEATER FIGHTER EVOLUTION.** The Bristol Fighter ("Brisfit") of the last war. The Boulton Paul Defiant of the present war, with power-operated gun turret. The Bristol Beaufighter (2 Hercules), and the De Havilland Mosquito, which has recently been disclosed to exist in a fighter as well as in a bomber version. Both Mosquitoes have Merlin engines.

# R.A.F. AIRCRAFT, 1918-1943




**R.A.F. TRAINERS. At the top the Avro 504 and the Avro Tutor. (Above) the De Havilland Tiger Moth, the Miles Master and (right) the Airspeed Oxford twin-engined trainer.**

Few aircraft in the last war, and in the years between the wars, had greater popularity than the Bristol F.2B. The name Bristol Fighter very quickly became contracted in the Service into "Brisfit." It had a span of 39ft. 3in. and weighed 2,800 lb. loaded. The speed was 125 m.p.h. near the ground and 113 m.p.h. at 10,000ft., with a Rolls-Royce Falcon engine of 265 h.p. The armament was a fixed gun for the pilot and a movable for the gunner.

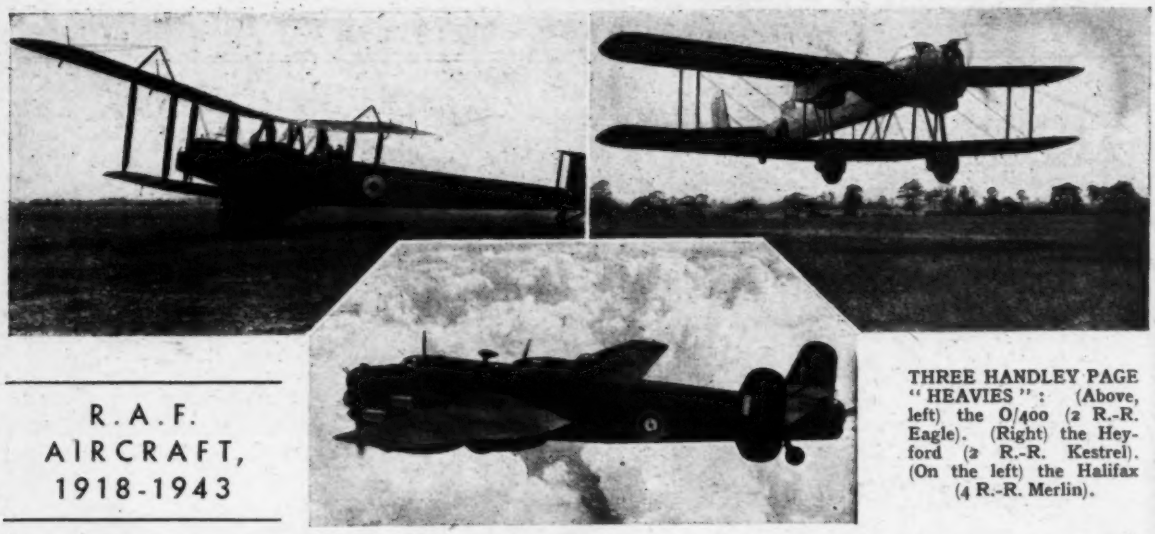
When it first appeared, in 1916, the D.H.4 was a reconnaissance machine fitted with 240 h.p. B.H.P. (later Siddeley Puma) engine. Subsequently more powerful engines were fitted, and the version which had a Rolls-Royce Eagle engine of 375 h.p. was used extensively as a day bomber. The wing span was 42ft. 6in. and the loaded weight 3,475 lb. The pilot sat under the top plane and the gunner behind the wings.

The experience obtained with the D.H.4 showed that the placing of the pilot was not ideal, either for fighting or bombing. In the D.H.9, developed from it, the pilot was aft of the wings, and the gunner close behind him, so that communication was facilitated. The Siddeley Puma engine of 240 h.p. was moved farther forward to put the c.g. right again. The narrow engine (the Puma was a six-cylinder vertical) made it possible to narrow down the nose of the fuselage, and the radiator was placed behind the engine, in the floor, where it could be raised and lowered to alter the cooling. The D.H.9 had the same wings as the D.H.4, and the loaded weight was 3,300 lb The speed was 116 m.p.h. at 6,500ft.

With the insistent demand for better performance and greater military load, the D.H.9 was supplemented by the D.H.9A, which was very like the 9 but had a Liberty 12-cyl. water-cooled engine of 400 h.p. instead of the 230 h.p. Puma. The wing span was increased to 46ft. and the chord by a couple of inches. The gross weight rose to 4,225 lb. and the speed to 130 m.p.h. at 6,500ft. The type remained in service with the R.A.F. for many years after the war.

The long-range day bomber was the D.H.10a, a twin-engined biplane with two 400 h.p. Liberty engines. The span was 65ft. 6in. and the gross weight 8,500 lb. The maximum speed was 134 m.p.h. at 6,500ft., and the range with 1,000 lb. of bombs was 700 miles. The D.H.10a did not go into large-scale production in time to be extensively used.

In the night bomber class there were three types in use: the FE 2B, the Vickers Vimy, and the Handley Page O/400. The FE 2B was a Farnborough design and was a single-engined "pusher" with 120 h.p. Beardmore water-



THREE HANDLEY PAGE "HEAVIES": (Above, left) the O/400 (2 R.-R. Eagle). (Right) the Heyford (2 R.-R. Kestrel). (On the left) the Halifax (4 R.-R. Merlin).

# R.A.F. AIRCRAFT, 1918-1943

cooled engine. It had a poor performance, but the placing of the crew in the nose of the nacelle gave a useful view to pilot and bomb aimer.

The Vimy was designed for long-range night bombing and was produced with various power plants. It did not go into production to take any part in the last war, but a modified version, with Rolls-Royce Eagle engines, later made the first direct flight across the Atlantic, piloted by John Alcock and Arthur Whitten Brown. The Vimy had a wing span of 67ft. 2in., and the R.R.-engined version had a gross weight of 12,500 lb. The speed was 98 m.p.h. at 5,000ft. and the duration 11-12 hours.

Finally, in the long-range night bomber class there was the Handley Page O/400, a twin-engined biplane with two 375 h.p. Rolls-Royce Eagle engines. The upper wing was of large span (100ft.) and the gross weight about 14,000 lb. The speed near the ground was 97 m.p.h. The O/400 was intended for raids on Berlin, but the Armistice intervened and the Berliners had to wait nearly 25 years for another Handley Page!

Now that we are using Hurricanes for attacking armoured forces in Africa, it is not without interest to recall that in the last war we had as its forerunner the Sopwith Salamander. This was a biplane single-seater with 200 h.p. B.R. rotary engine. The cockpit was practically a "box" of armour plating, which brought the gross weight up to 3,000 lb. Two machine guns on top of the fuselage formed the armament, and the speed near the ground was only 125 m.p.h. It was intended for use mainly against infantry.

The standard trainer in the R.A.F. in 1918 was the Avro 504, which survived in that capacity for very many years after the war. When the R.A.F.

TORPEDOPLANE EVOLUTION. (Top left), Blackburn Dart (Napier Lion). (Top right), Hawker Horsley (R.-R. Condor). (Bottom Left), Fairey Swordfish (Bristol Pegasus). (Bottom right), Bristol Beaufort (2 Bristol Taurus).

**SO MANY TO SO FEW.** Starting at the top and reading from left to right, these single-seater fighters are: Sopwith Camel (130 Clerget); S.E.5A (200 Viper); Gloster Grebe (385 Jaguar); A. W. Siskin (385 Jaguar); Bristol Bulldog (450 Jupiter); Gloster Gladiator (700 Mercury); Hawker Fury (600 Kestrel); Hawker Hurricane I (1,100 Merlin); and Supermarine Spitfire IX (Merlin).

came into being it had reached the series 504 K, which could be fitted with any of the rotary engines of from 100 to 150 h.p. The wings were of high aspect ratio, with a span of 36ft. The loaded weight was about 1,830 lb.

In the seagoing branch an odd assortment of types were, as already mentioned, employed on the different tasks which, until the formation of the R.A.F., fell to the R.N.A.S. Seaplanes of the Short "two-two-five" type (so named from the 225 h.p. Sunbeam engines fitted) were used extensively for patrol. They were twin-float seaplanes, a characteristic of which was the very large "overhang" of the tips of the top plane. The "two-two-five" was the first seaplane to carry a torpedo, and was thus the forerunner of the modern torpedoplane.

Another and very different type used for patrol over the sea was the Blackburn Kangaroo. In its original form it was a twin-engined seaplane, but it was afterwards changed to a landplane and used for anti-submarine patrols

# R.A.F. AIRCRAFT, 1918-1943

over the North Sea. Two 250 h.p. Rolls-Royce Falcon engines were mounted in the gap between the planes, the upper of which had a very long overhang. The loaded weight was about 8,000 lb. and the speed 87 knots.

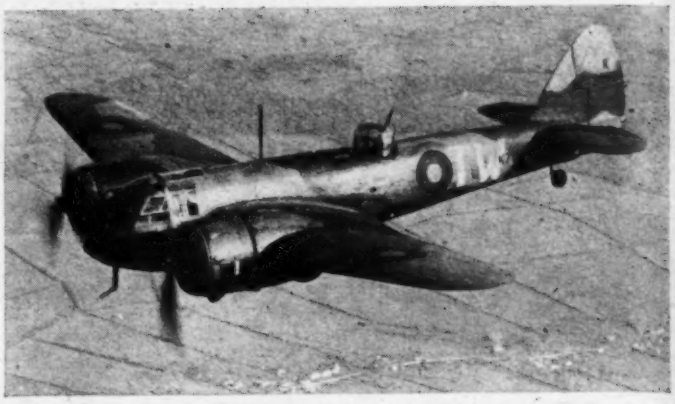
At this time, too, the Fairey Aviation Co., Ltd., was becoming well established in the seaplane market, the type III in particular laying the foundation for future Fairey greatness. The most powerful version had the 360 h.p. R.-R. Eagle engine, which gave the IIIC a speed of 97 knots. The total loaded weight was 5,000 lb. In those days the floats were, of course, made of wood, were quite short, and had a single step so that tail floats under the stern of the fuselage were necessary.

A considerable number of flying boats, mostly twin-engined biplanes, were also in use over the North Sea. They had been developed from American Curtiss designs by Commander John Porte, R.N., and were built by many firms. The most notable types were the F 3 and F 5. They had wooden hulls and flaring chines, and on the whole stood up well to the arduous work of long patrols.

It is scarcely surprising that, from a technical point of view, there was relatively little progress during the first six or seven years after the war. The R.A.F. was reduced almost to vanishing point, and orders for new aircraft types were counted in twos and threes. Of real quantity production there was none, and the aircraft firms struggled along as best they could, often on the point of giving up. Many attempted to become established in the commercial aircraft market, and a few succeeded in doing so, but in the main it was a question of "hanging on." Progress was maintained by isolated examples of new types.

In the single-seater fighter class the Sopwith Snipe continued to be used for several years. A Siddeley Siskin appeared in 1921 with metal fuselage and wooden wings, but did not go into production until some years later, when it was destined to become the standard fighter of the R.A.F. and the first all-metal machine in production.

A torpedoplane which was to be used to a considerable extent was the Blackburn Swift with the 450 h.p. Napier Lion engine. This engine was of the 12-cylinder "broad arrow" type and was to become the outstanding engine of the R.A.F. for a great many years. The Swift had a range of about 400 miles and a speed of a little over 100 m.p.h. A similar and improved version was known as the Dart.



**BEGINNINGS OF MODERNITY. The Bristol Blenheim, Mark I, laid the foundation for a number of types. It has the short nose and is fitted with two Mercury VIII engines.**

## Metal Construction

When the Air Ministry decided that all aircraft for the R.A.F. should be made of metal, the different manufacturing firms set to work to evolve new methods of construction. Steel was the material generally employed, and it was used in the form of strip rolled to different sections.

During 1923-24 the Armstrong-Whitworth Siskin fighter with Siddeley Jaguar engine was produced entirely in metal. Another firm which carried out a great deal of development work on strip-steel construction was Boulton and Paul, but that firm did not receive any very substantial orders for aircraft of their own design during that period.

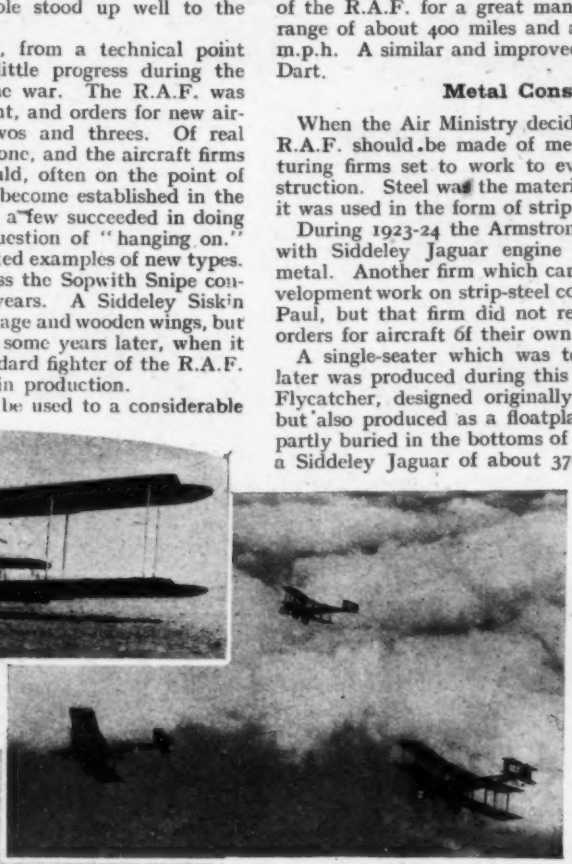
A single-seater which was to come into extensive use later was produced during this period. It was the Fairey Flycatcher, designed originally as a deck-landing fighter but also produced as a floatplane amphibian with wheels partly buried in the bottoms of the floats. The engine was a Siddeley Jaguar of about 370 h.p.

In the heavy bomber (or night bomber) class the Vickers Virginia became adopted extensively. It was slow (only about 100 m.p.h.) but carried a large load, had a long range, and landed slowly. The gross weight was 16,500 lb. and the engines two Napier Lions of 450 h.p. each. A somewhat different machine was the Vickers Victoria troop carrier, which had a more roomy fuselage.

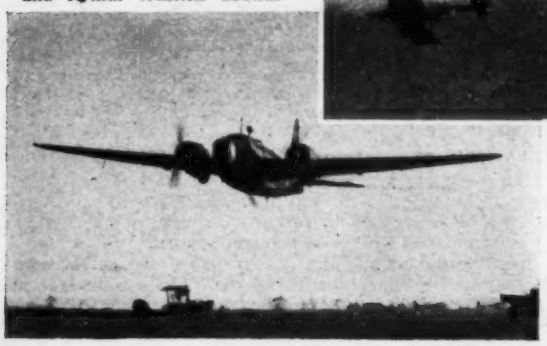
The Gloster Grebe single-seater fighter appeared in 1924, and was to become popular during the following years. It was a biplane with Siddeley Jaguar engine, which gave it a speed of 142 m.p.h. at 10,000ft.

The Avro 504 still held the field unchallenged in the trainer class. By 1924 it had reached the "N"

**The Vickers Vimy (2 R.-R. Eagle) flew the Atlantic in 1919, piloted by John Alcock and Arthur Whitten Brown.**



**The Vickers Virginia was the R.A.F.'s heavy bomber for many years. It had Bristol Jupiter or Napier Lion engines.**



**The Vickers Wellington (left), of "geodetic" construction, is still doing good work in the present war. It has been fitted with Bristol Pegasus and Rolls-Royce Merlin engines.**

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series, which had the Siddeley Lynx radial engine of 160 h.p. This engine turned out to be very reliable and was a great improvement in every way on the rotaries previously used for school work.

Of the 1924-25 period there are few outstanding types to record. The most important, as it turned out, was the appearance of the first Supermarine Southampton flying boat. This type, originally with wooden hulls, was designed and built in seven months. It was a twin-engined boat with two Napier Lion engines and had a gross weight of 14,300 lb. The speed was 108 m.p.h. In the same year Mr. R. J. Mitchell also designed the Supermarine S 4 for the Schneider contest. This machine was to become the forerunner of all the Supermarine Schneider monoplanes, the last of which, the S 6B, won the contest outright in 1931 at a speed of 340.08 m.p.h.

An event which was to have great consequences was the delivery, towards the end of 1924, by Short Brothers, of a metal hull for the superstructure of an F 5 flying boat. That laid the foundation for the long series of successful flying boats afterwards produced by this firm. The great advantage of this type of hull was that it avoided the water soakage which, in a wooden hull, might sometimes amount to several hundred pounds.

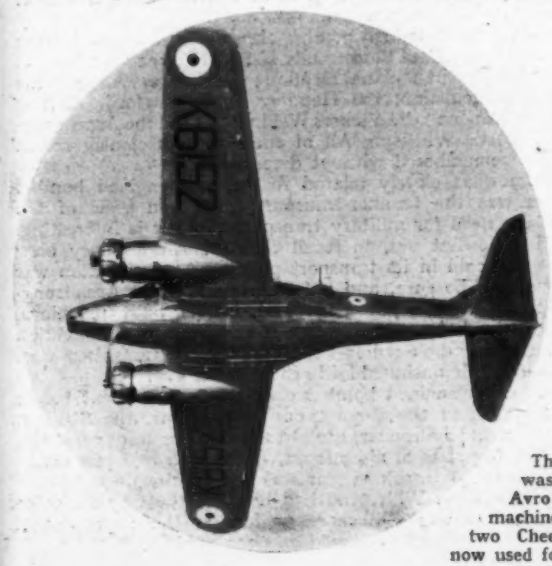
The 1925-1926 period saw something like a renaissance in aircraft production. Firms had mastered the new technique of metal construction, and several new aircraft types with good performance were produced.

In the fighter class there was the Siskin IIIA, which had a supercharged Siddeley Jaguar engine. The maximum speed was 155 m.p.h. at 10,000ft., and the ceiling was 28,000ft., which was considered good for those days. The loaded weight was 3,000 lb. The Bristol Bulldog, first with Jupiter and later with Mercury radial engine, was an exceptionally clean biplane. It weighed 3,120 lb. loaded and had a speed of 178 m.p.h. at 10,000ft. It was to remain for many years the standard fighter of the R.A.F.

Bomber production also went ahead in those years.

The Armstrong-Whitworth Whitley bomber was originally fitted with Siddeley Tiger radials. Later Rolls-Royce Merlins were substituted.

The Short Stirling is the heaviest of our "heavies" (30 tons) and can carry up to 8 tons of bombs. The engines are 1,600 h.p. Bristol Hercules.




The Avro Anson (left) was developed from the Avro 652 commercial machine. It is fitted with two Cheetah engines and is now used for advanced training.

Boulton and Paul produced the Sidestrand, which was adopted by the R.A.F., and which was later to develop into the Overstrand, the aircraft which first had a power-operated gun turret mounted in the nose of the fuselage.

Flying boats that first appeared during the 1926-27 period were the Blackburn Iris three-engined flying boat with Rolls-Royce Condor engines of 670 h.p. each, and the Short Singapore all-metal flying boat with two engines of the same type.

The Hawker company developed the Woodcock, which became the standard night fighter of the R.A.F., and the Fairey company brought the series III up to the IIIF, which was to do such good work for many years in the service with the fleet.

In 1927 Mr. C. R. (now Sir Richard) Fairey caused a commotion by introducing the Fox, a light biplane day bomber. It was fitted with the American Curtiss D 12 water-cooled engine, and set an entirely new fashion in biplane design. The Firefly was a somewhat similar but smaller machine, and was a single-seater fighter.

For Army Co-operation the Armstrong-Whitworth firm introduced the Atlas, a two-seater biplane weighing 4,000 lb. With a Siddeley Jaguar engine of 450 h.p., it had a maximum speed of 146 m.p.h. at low levels.

## Torpedoplanes

The Hawker Horsley, introduced some years earlier and used both as a day bomber and as a torpedoplane, was supplemented by the Blackburn Ripon, which was fitted with the Napier Lion engine, the power of which had now been stepped up to 570 h.p. The loaded weight was 7,300 lb., and the maximum speed was 132 m.p.h. The Ripon was also produced as a twin-float seaplane.

The Gloster Gamecock fighter supplemented the Grebe and ultimately replaced it. It had a Bristol Jupiter engine of 450 h.p., weighed 2,800 lb., and a speed of 144 m.p.h.

A general-purpose type built in large numbers was the Westland Wapiti. It was used for bombing, photography, and reconnaissance, and had to carry a great deal of equipment. For certain purposes it was fitted with extra long-range tanks stowed vertically. The engine was a Bristol Jupiter, and the normal loaded weight was 4,240 lb. This could be increased by 600 lb. for long-distance work.

In 1926 the Rolls-Royce company passed through its type tests an engine which was to make history during the years to follow. This was the type F 10, a direct drive 12-cylinder water-

# R.A.F. AIRCRAFT, 1918-1943

cooled. This engine was afterwards provided with airscrew reduction gear, and ultimately developed into the Kestrel. The F type and Kestrel made possible several new aircraft types which were to be the backbone of the R.A.F. for many years.

Chief of these was the Hawker Hart, a single-engined high-performance day bomber, and the Hawker Fury single-seater fighter. The Hart was a heavily staggered biplane with a loaded weight of 4,320 lb. and a speed of 184 m.p.h. at ground level and 187 m.p.h. at 10,000ft. (the Rolls-Royce F engine was supercharged). Variations of the Hart were the Audax, an Army Co-operation two seater, the Osprey Fleet Fighter Reconnaissance, the Demon two-seater fighter, the Hind and the Hart general-purpose biplanes.

The Fury single-seater interceptor fighter had the F engine (later Kestrel), and did 240 m.p.h. at 14,000ft. A Fleet fighter version of the Fury was called the Nimrod.

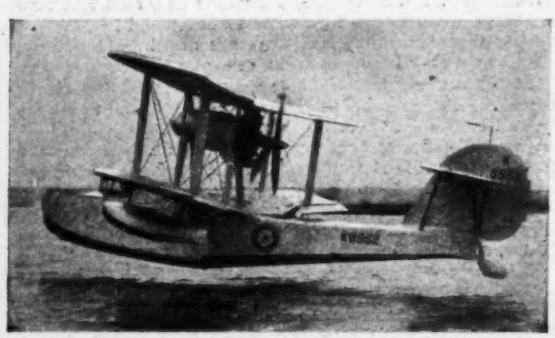
### Early Troop Carriers

In the heavy class the large but slow Victoria troop carriers continued to do good work. At the end of 1928 they evacuated the European population of Kabul, some 600 in all. In that year the Vickers firm made history by fitting a gun turret in the tail of the Virginia bomber.

For the period of seven or eight years before the outbreak of the present war there was such an increase in development and progress that it seems better to deal with the aircraft produced by classes rather than by years.

At the end of the "twenties" the Fury was the outstanding machine in the single-seater fighter class, thanks to its Rolls-Royce liquid-cooled engine of low frontal area. The Gloster Gamecock and the Bristol Bulldog continued to serve us faithfully, and it is worthy of note that the Gloster SS 19, a multi-gun fighter, started the fashion (although the machine itself was not adopted) of the modern fighter as regards armament. It had two machine guns in the fuselage and four on the wings. In 1934-35 came the Gloster Gauntlet and Gladiator. The former, with Bristol Mercury engine, weighed 4,000 lb. and had a speed of 230 m.p.h. at 15,500ft. The Gladiator, with cantilever undercarriage, was faster, with 255 m.p.h at 14,500ft. The Gauntlet had two synchronised machine guns, while the Gladiator had in addition two under the lower wing. These single-seater fighters were in service until they were supplanted by the modern Hurricane and Spitfire monoplanes, which the Rolls-Royce Merlin engines made possible.

The single-engined, two seater day bomber began to die out during this period, it being realised that as a class its usefulness was limited. We had the Fairey Gordon with Siddeley Panther engine, and the Vickers Wellesley (Bristol Pegasus). The latter was a long-range slow machine, but established a world's distance record by flying from Egypt to Australia non-stop, a distance of 7,162 miles. In more modern time came the Fairey Battle with Rolls-Royce Merlin. The Battle had a speed of 210 m.p.h. and was of stressed-skin construction.



**AMPHIBIOUS. The Supermarine Walrus (775 Pegasus) is still doing excellent work in the Air/Sea Rescue Service.**

**TWENTY-FIVE YEARS OF ARMY CO-OPERATION. The R.E.8 (130 R.A.F. engine) was used for artillery observation. The A.-W. Atlas (480 Jaguar) covered a portion of the 'tween-war period. The Westland Lysander (900 Perseus) in still in service.**

In the twin-engined bomber class evolution included the Boulton and Paul Sidestrands II and III, the Overstrand; the Fairey monoplane Hendon; the Avro Anson; the Bristol Blenheim; the Handley Page, Heyford, Harrow and Hampden; the Vickers Wellington; and the Armstrong-Whitworth Whitley. All of these are sufficiently recent to be remembered without description.

Somewhat closely related to the twin-engined bomber class was the bomber-transport class. In view of the present need for military transport types it is interesting, and somewhat sad, to recall that the Air Ministry blew hot and cold in its transport policy. A specification was issued, to be sure, and a few firms, such as Armstrong-Whitworth, Handley Page and Bristol built machines. The Bristol type 130 was chosen and went into production on a considerable scale as the Bombay. Manufacture was, however, discontinued fairly early in the war.

The four-engined bomber class was non-existent before the war, and the three types in use now, the Stirling, Halifax and Lancaster, are already familiar to our readers.

Another class of aircraft on which work had just begun before the outbreak of war was the twin-engined fighter. The Westland Whirlwind had been on the way for some years, but was still more or less in the experimental

(*Continued on page 342.*)

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# Aircraft Types and Th

## SUPERMARINE SPITFIRE IX

POWERED by the Rolls-Royce Merlin LXI liquid-cooled, "V" type, 12-cylinder engine equipped with two-speed, two-stage supercharger, the Spitfire IX is the latest development of this famous British fighter to be publicly announced as in service with R.A.F. Fighter Command.

Altogether there have been some 20 different versions of the Spitfire, including the Seafire for carrier operation, and tropical models, and they have been fitted with numerous versions of the Merlin engine of steadily increasing horse-power.

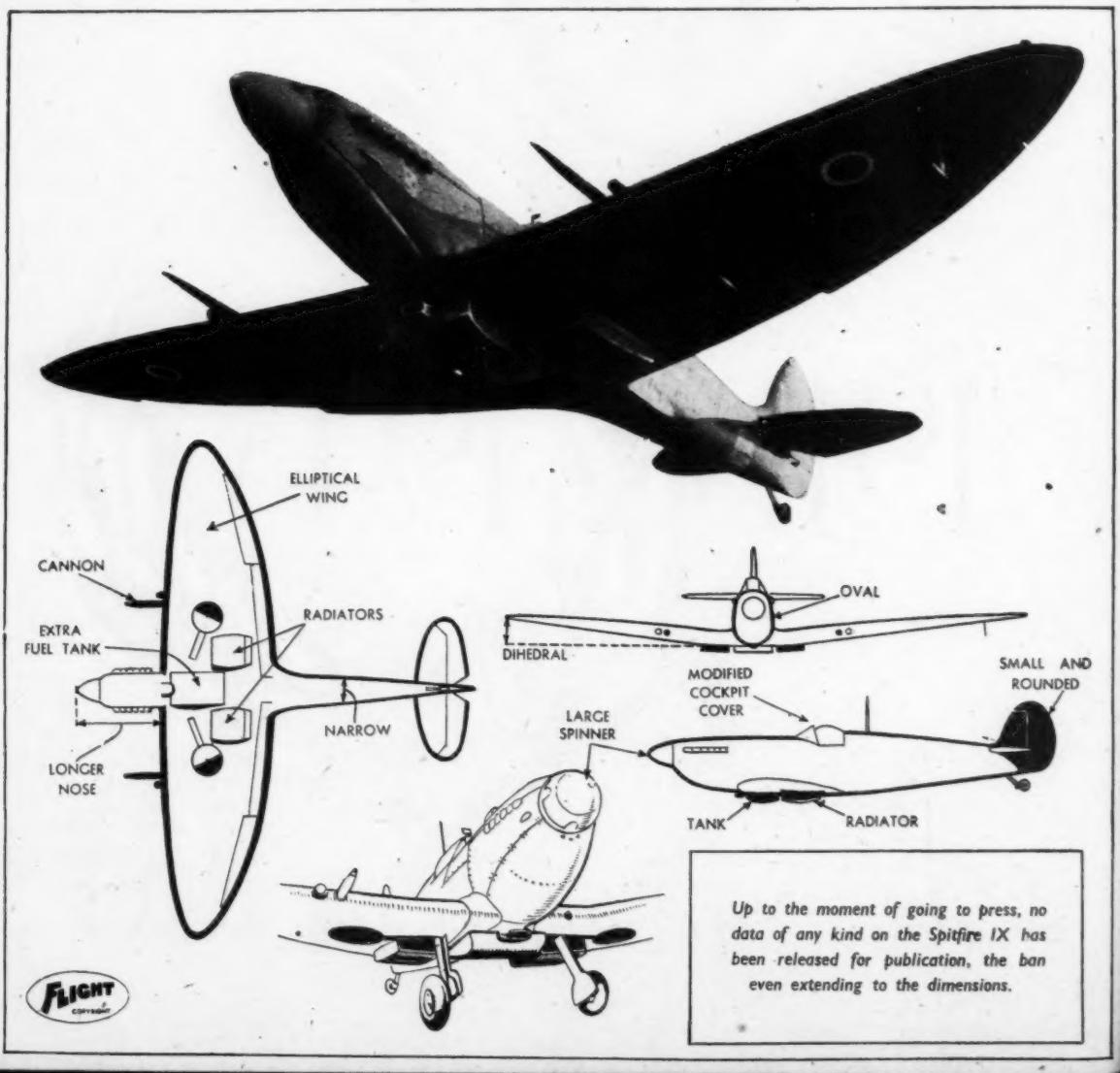
Unfortunately it is still not permitted to give any precise information about the Spitfire IX, although there is good reason for supposing that the enemy now knows all there is to know about this aircraft and that the authorities are perfectly well aware of the fact. Yet not even its dimensions may be given, though quite accurate general arrangement drawings may be reproduced, as seen below.

Distinctive features of the latest "Spit" will be best appreciated if the accompanying illustrations are studied alongside those of the Spitfire V which was published in this series on November 12th last.

For example, it will be seen that the nose has been increased in length to accommodate the greater overall length of the Merlin LXI with its two-stage supercharger and intercooler. The exhaust outlets, it will be noticed, have also been modified and so has the windscreen (which has an increased rake) and the cockpit cover. From the head-on view, the most obvious of all differences between the two types is at once apparent, namely the presence on the Spitfire IX of two radiators—one beneath each wing root—and a shallow auxiliary fuel tank under the centre-section.

The wing plan has also been slightly modified and now has a less curved leading-edge, though this is not sufficiently marked to be at all easy to detect in flight even from a full plan view.

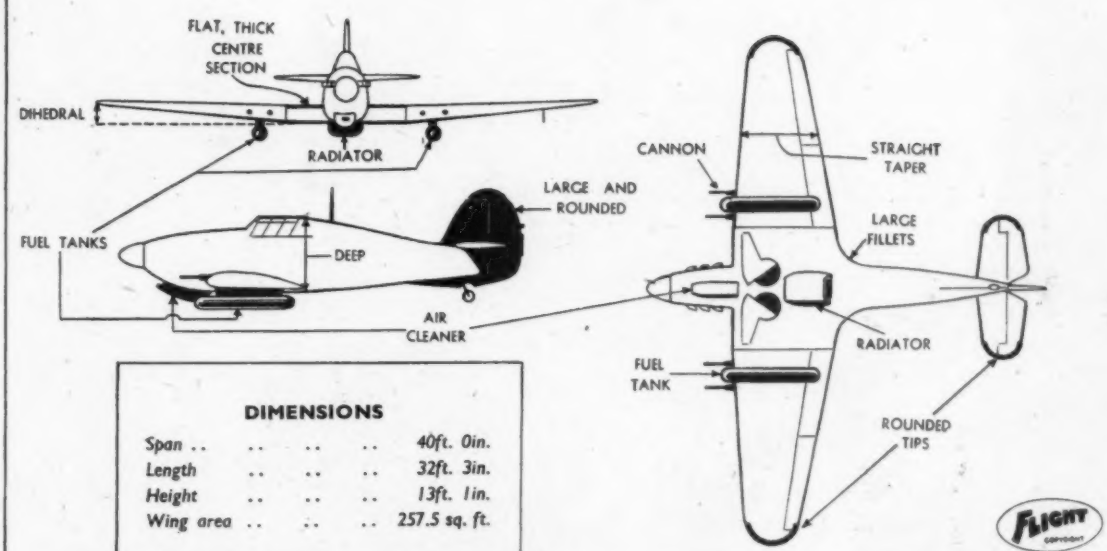
Incidentally it may be mentioned that the small projections in the leading-edge just outboard of the cannon mark the provision for mounting two more cannon.




*Up to the moment of going to press, no data of any kind on the Spitfire IX has been released for publication, the ban even extending to the dimensions.*

# Their Characteristics

## TROPICAL LONG-RANGE HURRICANE IIc




**DIMENSIONS**

| | |
|---|---|
| *Span* .. .. .. .. | *40ft. 0in.* |
| *Length* .. .. .. | *32ft. 3in.* |
| *Height* .. .. .. | *13ft. 1in.* |
| *Wing area* .. .. .. | *257.5 sq. ft.* |

IT would be difficult to name an aircraft which has proved more adaptable and versatile than the Hawker Hurricane, nor one which has "kept its youth" to such good effect for so long a time. For the Hurricane is still a modern aircraft in spite of the fact that it first appeared more than seven years ago.

The variety of forms in which it has seen service at least equals that of the Spitfire in number, and certainly exceeds it in divergence, for it fulfils with admirable efficiency the roles of day and night fighter variously armed with machine guns, cannon, or a mixture of both, as a catapulted fighter from merchant ships, as a carrier-borne fighter with the Fleet Air Arm, and as a fighter-bomber. Furthermore it can be hung with auxiliary fuel tanks to increase its range and, like any other machine, be equipped with "tropical kit" externally manifested in the bulge of an air-cleaner for protection against desert dust.

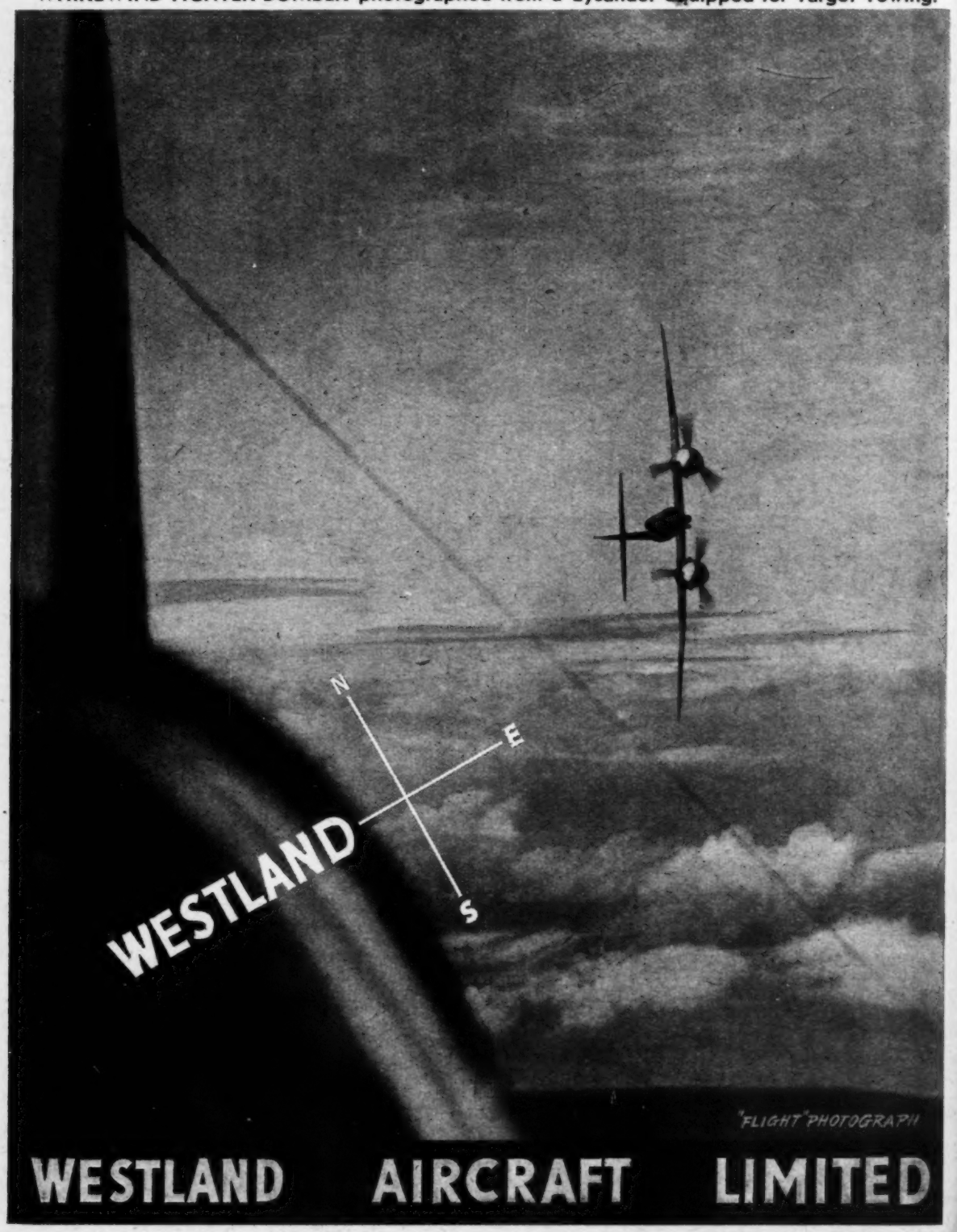
It is in the last-named guise, namely the long-range, tropicalised version of the Hurricane IIC, that this R.A.F. maid-of-all-work is reviewed and illustrated on this page.

Some idea of the steadily mounting burdens placed upon the uncomplaining Hurricane may be gauged from the fact that its all-up weight has increased from less than 6,000 lb. to approximately 8,250 lb. for this latest version, yet the wing loading is still by no means excessive at 32 lb./sq. ft. As a result, its manœuvrability remains excellent.

Naturally one cannot pile on drag in the way eloquently illustrated above without some sacrifice in sheer speed, but even so, the tropicalised IIC with its two auxiliary long-range fuel tanks slung below the roots of the wing outer-panels, is still capable of a top speed of 312 m.p.h., which its 1,280 h.p. Rolls-Royce Merlin XX engine achieves at 18,000ft. Maximum cruising range is about 1,500 miles so equipped. Without the external fuel tanks and the tropical air-cleaner, its top speed is 340 m.p.h. at 21,500ft.

Apart from the special features already enumerated and shown in the photograph and drawings above, the basic Hurricane characteristics remain unchanged.

WHIRLWIND FIGHTER-BOMBER photographed from a Lysander equipped for Target Towing.




WESTLAND AIRCRAFT LIMITED

# ENGINE PROGRESS 1918-43

## REFLECTIONS UPON 25 YEARS OF AIRCRAFT ENGINE DEVELOPMENT: IMMENSE STRIDES DURING LIFE OF R.A.F.

*By G. GEOFFREY SMITH, M.B.E.*

LOOKING back over the 25 years' existence of the Royal Air Force reveals the immense strides that have been made in the design and performance of aircraft power units. From every aspect, be it quality, volumetric efficiency, power output, specific weight per horse-power and, above all, reliability, progress has been so marked that to compare them with the simple types that were employed a quarter of a century ago is most impressive.

Such has been the technical progress in aircraft engines over the past quarter of a century that it has only been possible in a brief space to compare their general features. From simple two-valve engines largely developed from racing car practice and weighing 3 lb. per h.p., to-day much larger four-valve engines of complex construction, and mounting drives for the various auxiliaries on modern aircraft, develop around 1 h.p. per lb.

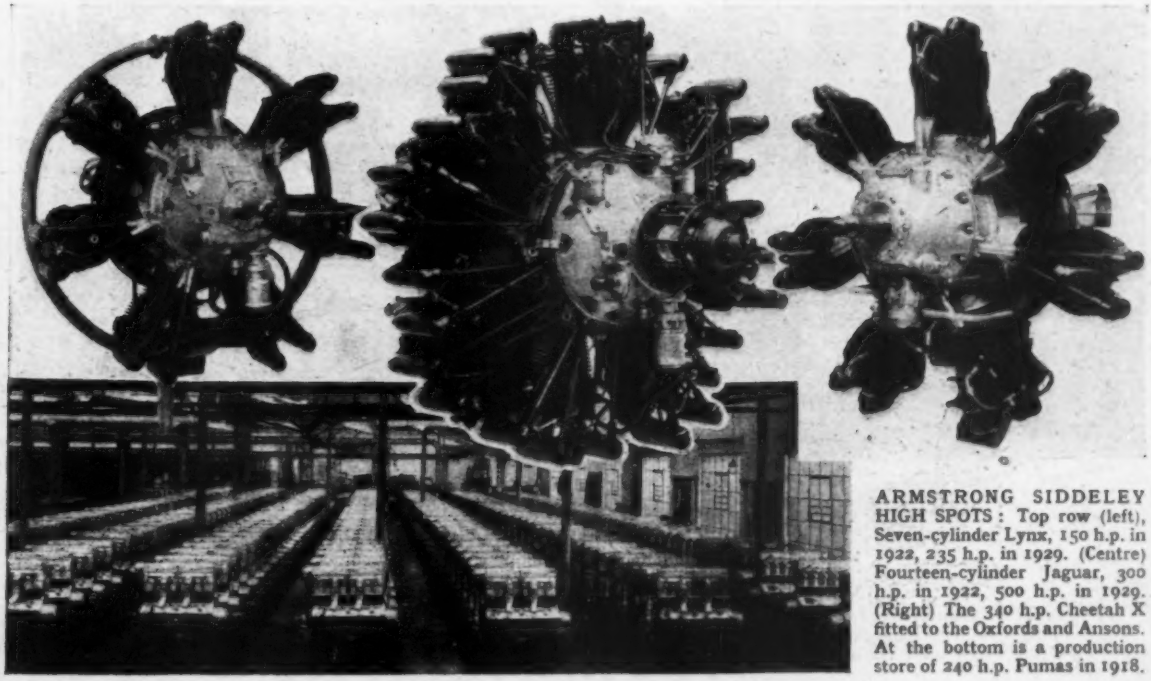
*TO attempt to review in brief space the broad subject of aircraft engine development over 25 years is ambitious, and in a way unsatisfactory, as so much must remain unchronicled. In this summary of the trend of design the writer, who was a captain in the R.A.F. engaged upon engines in the last war, touches upon the salient changes and quotes a number of informative comparisons.*

In 1918 the engine produced in greatest numbers was the Siddeley Puma, which developed 240 h.p. at 1,400 r.p.m. It was a naturally aspirated six-cylinder water-cooled vertical in-line unit with two exhaust and one inlet valve per cylinder, simple in design, with a direct-drive airscrew. It took only about 1,380 man-hours to produce, according to records of that time, and cost about £900. A modern supercharged engine with 12, 18 or 24 cylinders, far and away more complex in its equipment, costs some £3,000 and occupies fully 3,000 man-hours in production by the most modern machine tools and factory technique.

After a wonderful career, rotary radial engines were becoming outmoded, but there were several notable examples even in 1918, including the Clerget manufactured by Gwynnes and the BR 2 made by Humber, Ltd., and developed by W. O. Bentley, now designer for Lagonda Motors. Also considerable numbers of the Gnome Monosoupape engine still existed. As the name implies, this engine had only one valve per cylinder; this was the exhaust valve, located in the head. Air was admitted via the hollow stationary crankshaft and mixed with fuel injected from a nozzle into the crankcase. Ports cast in the skirt of the cylinder projecting into the crankcase were uncovered by the piston at the bottom of the stroke, so admitting mixture to the cylinder. A favourite engine of the time was the nine-cylinder Le Rhône rotary, developing some 80 b.h.p. and weighing 258 lb.

Engines of V type were being favoured for their compactness. Among the notable water-cooled examples were the comparatively new Rolls-Royce 360 h.p. Eagle twelve-cylinder engine (with two valves per cylinder), the 212 h.p. eight-cylinder Sunbeam Arab (two exhaust and one inlet per cylinder), and the 180 h.p. eight-cylinder 90 deg. Hispano Suiza (two valves per cylinder), known as the Wolseley Viper, produced by Wolseleys, of Birmingham.

In common use was the R.A.F. V-type eight-cylinder air-cooled engine on the same general lines as the Renault. At that period, too, Napiers were manufacturing the Arab, and gradually transferring their energies to the 450 h.p. twelve-cylinder three-row (broad arrow) Lion. This engine,



**ARMSTRONG SIDDELEY HIGH SPOTS: Top row (left), Seven-cylinder Lynx, 150 h.p. in 1922, 235 h.p. in 1929. (Centre) Fourteen-cylinder Jaguar, 300 h.p. in 1922, 500 h.p. in 1929. (Right) The 340 h.p. Cheetah X fitted to the Oxfords and Ansons. At the bottom is a production store of 240 h.p. Pumas in 1918.**

# ENGINE PROGRESS, 1918-1943

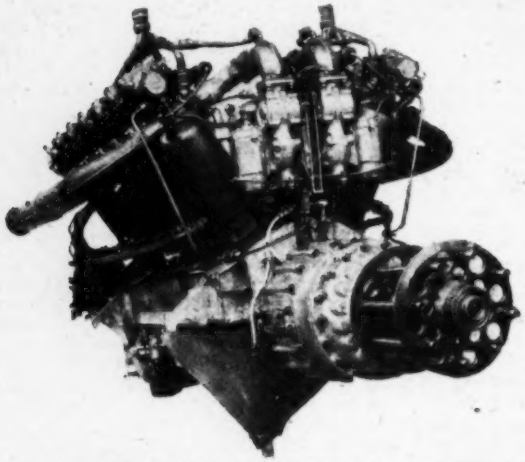
designed by A. J. Rowledge, was rapidly coming into favour as the biggest unit then available for aircraft, and it remained in service for many years; a high-speed type Lion in 1926 developed 500 h.p. at 2,250 r.p.m. and scaled 950 lb. dry. Three years' research produced the supercharged Schneider engine which gave 1,320 b.h.p. for 1,170 lb. weight.

Twenty-five years ago the average time expended in producing an engine of simple specification, such as to-day would suit training aircraft only, was 2,500 hours, although some firms were able considerably to improve upon this figure. As in the present war, car manufacturers were pressed into service to produce aircraft power units. In addition to the companies already named, Arrol-Johnston, Daimler, Crossley, Swift and Lanchester were so employed.

In the summer of 1918, the nine-cylinder radial A.B.C. air-cooled engine of 340 h.p., designed by Granville Bradshaw, was adopted for large-scale production in many factories, but the arrival of peace cancelled the plan, although a number of prototypes were manufactured.

Supercharging was in its infancy in the Great War, but engines were fitted experimentally with engine-driven or exhaust-turbo blowers, and certain designs embodied multi-stage blowers even in those early days.

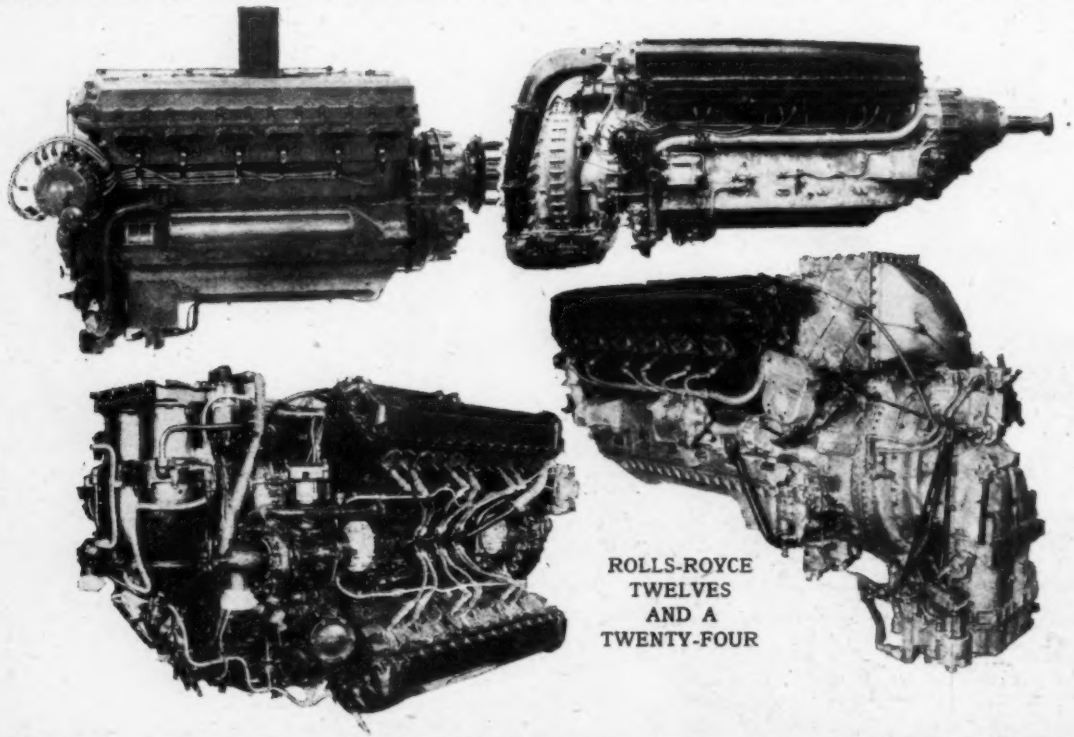
Following the peace of 1918, engine development was inevitably slowed down. It is a sad commentary that it needs a war to stimulate intensive development and progress. A distinct fillip to aircraft engine development occurred when the Bristol Co. acquired the Cosmos Engineering Company and concentrated attention upon various types of air-cooled poppet valve radials, among them being the Lucifer and Jupiter. In later years the Bristol Co. perfected the single sleeve valve patented by Burt and MacCullum, which led to the introduction of the now familiar Perseus, Hercules and Taurus, the two latter being twin-row types. The poppet valve Bristol Mercury was selected in 1936 for mass production under the shadow factory expansion scheme.



**A 375 H.P. ROLLS-ROYCE EAGLE VIII : This type powered single- and twin-engined bombers and flying boats of 1918.**

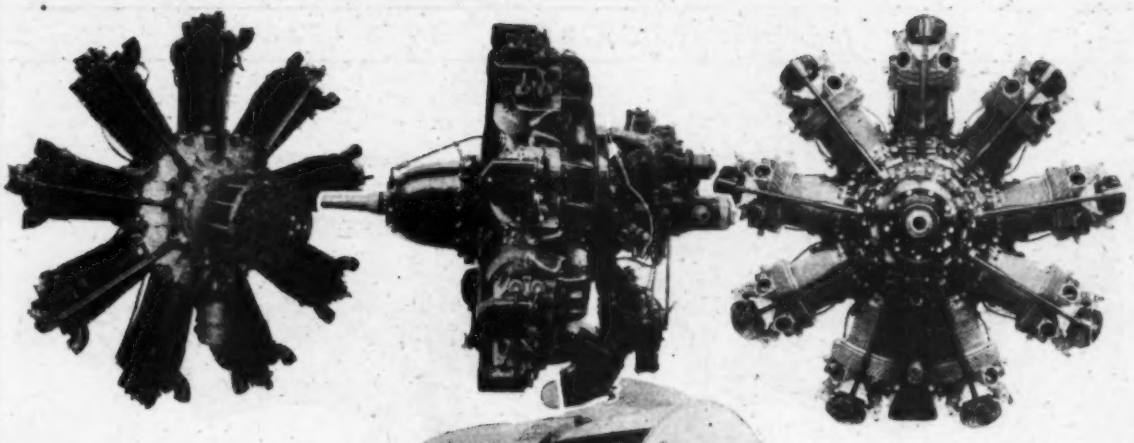
### Rolls-Royce Vee Twelves

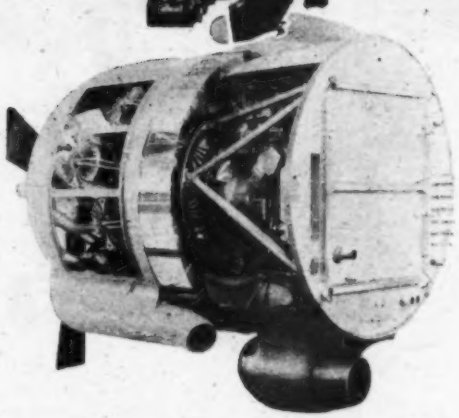
The famous Rolls-Royce firm never ceased research and development of aircraft engines subsequent to their entry into the aircraft arena in the great war, with a vertical six-cylinder Hawk. In the interim they have produced a



**ROLLS-ROYCE TWELVES AND A TWENTY-FOUR**

**(Top left) The unsupercharged 12-cylinder 480 h.p. Kestrel of 1927. It was also available as a moderately supercharged engine or with full supercharging. (Top right) The 2,300 h.p. Racing engine for the Schneider contest in 1931. (Bottom left) The 1,960 h.p. 24-cylinder Vulture X engine, and (Bottom right) The Merlin LXI with two-speed two-stage supercharger fitted in the Spitfire IX height-cover fighter.**



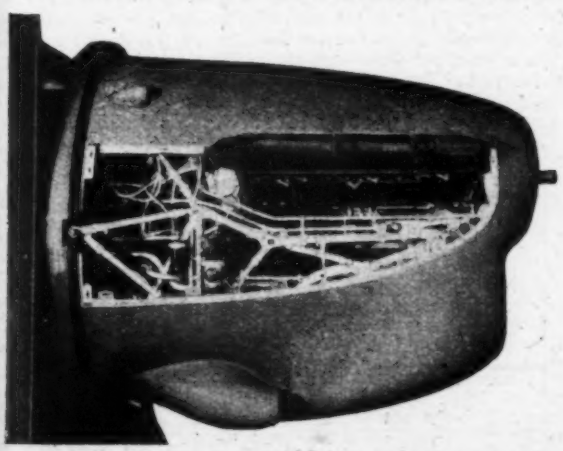


**BRISTOL FASHION: Top Row (Left) The Mark II Jupiter of 400 h.p. which was developed with a standardised power egg mounting in 1922. It developed 595 h.p. in 1932. (Centre) The 840 h.p. Mercury which has been produced in thousands in our shadow factories. (Right) The 1,000 h.p. Pegasus, Bristol's highest powered poppet valve engine. (Bottom) The 14 cyl. two-row sleeve valved Hercules of 1,425 h.p. in its complete power egg.**

remarkable range of twelve-cylinder 60 deg. V types, notably the Falcon, Eagle, Kestrel, Condor and Buzzard, their efforts culminating in the twelve-cylinder Merlin in 1934, which engine in its varying forms has won fame the world over. Of 27 litres capacity, the engine has progressed through many stages of improvement, mainly connected with the supercharger, and is now able to attain the stratosphere, the latest Mark 61 having a two-stage two-speed supercharger to provide higher power at high altitudes.

Armstrong Siddeleys produced several first-rate single-row radials, the Lynx and Genet Major, also an advanced type of double-row radial known as the Jaguar. The Cheetah seven-cylinder radial is a standardised type to-day.

In the years prior to 1930, epicyclic reduction gearing for airscrew drive was applied to air-cooled engines—liquid-cooled engines already had spur gearing. This general adoption of geared-down airscrews enabled an increase in crankshaft revolutions and a more suitable speed for the airscrew, which at that time almost exclusively had two blades of fixed pitch. Further major changes in engine design followed the introduction of variable-pitch airscrews. Aircraft engine design is very closely associated with airscrew progress. For years engine development was retarded by the form of airscrew available. Indeed, it can be said that aircraft design as a whole was governed by the slow rate of progress with airscrews. When, in 1928, Dr. Hele Shaw and T. E. Beecham introduced their hydraulic governor to provide variable pitch for the blades, the prospect was opened for further big advances both in aircraft and engine design. At that time ability to take off a heavy aircraft was a governing factor, and a successful variable-pitch airscrew to provide greater thrust by enabling engine r.p.m. to be maintained was a crying need. Notwithstanding that fact, the feared complication of a v.p. airscrew checked adoption, and it took the inventors years before their design was finally accepted. About that time a number of other airscrew designs appeared with the blade pitch governed by hydraulic, electrical or mechanical means. To-day three- or four-bladed airscrews have displaced the fixed-pitch two-blade type, and variable-pitch, constant-speed, full-feathering and even reversible-pitch airscrews are now standardised R.A.F. equipment. Contra-rotating airscrews with variable-pitch blades is the latest development in anticipation of the larger power units coming into service.

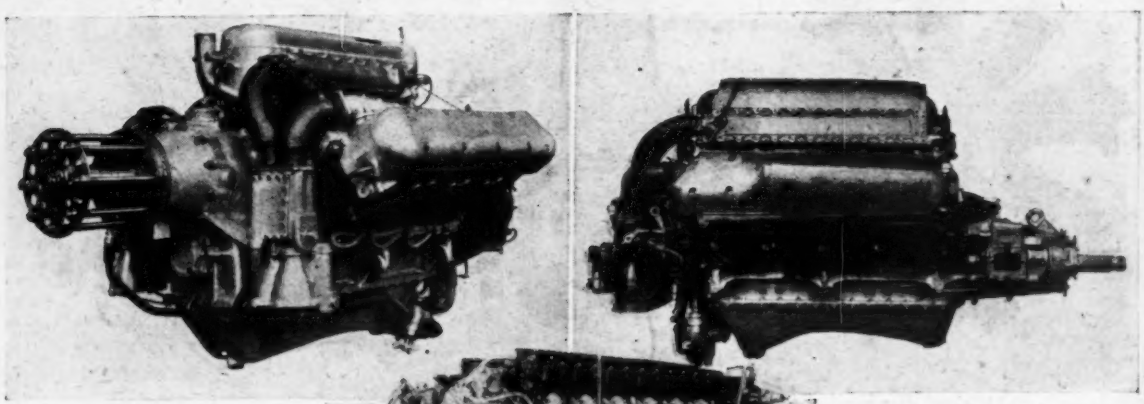


**A Rolls-Royce Merlin standardised power egg as fitted on the Avro Lancaster.**

## Technical Progress

The lean years in aircraft production were those following the Great War until about 1930, when outstanding achievements in the air began to attract universal attention. Despite meagre financial allocations, technical progress during these lean years was never allowed by the Air Staff to lapse, and one or two firms were busily engaged upon the development of engines in collaboration with the Royal Aircraft Establishment. Unobtrusively, painstaking research and experiment on the part of aeronautical and metallurgical specialists made possible larger diameter cylinders fitted with four valves of non corrodible material, higher piston speeds and higher compression ratios. Ethylene-glycol cooling enabled smaller radiators of compact form. For air-cooled radial engines greatly improved cowling was devised. Low pressure superchargers had become the vogue, the great benefits of pressure charging of the cylinders having, by this time, been

# ENGINE PROGRESS, 1918-1943



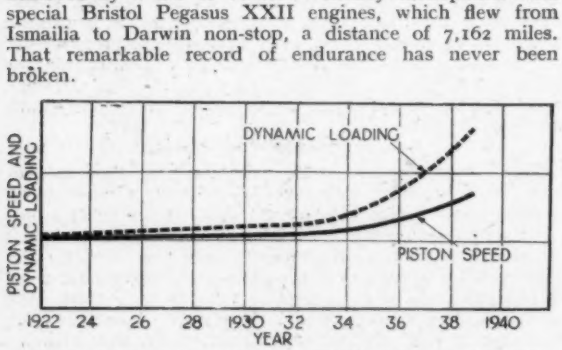
(Top left) The broad arrow Napier Lion of 450 h.p. in 1920. It had a reduction gear for the airscrew.

(Top right) The supercharged racing type Lion produced for the Schneider Trophy of 1929. It developed 1,320 b.h.p.

(Below) The H type 24-cylinder Dagger was the precursor of the Napier Sabre. 700 b.h.p. at 3,500 r.p.m.

substantiated. By this concentrated attention British designers and research engineers succeeded in keeping the comparatively small engine industry in the van of progress. In 1928 Rolls-Royce tested an exhaust-driven turbo supercharger with two stages for the compressor on a 12-cylinder Condor of 650 h.p., but finally adopted a geared centrifugal blower driven from the crankshaft. The Napier Lion, Bristol and Liberty engines were also tested with exhaust-driven superchargers many years ago. A notable design of this era was the Napier 16-cylinder X type Cub engine.

Royal Air Force pilots or ex-pilots had over a period set up many world's records, Capt. John Alcock and Lt. Whitten Brown making the first direct crossing of the Atlantic by air in June, 1919, on a Vickers-Vimy biplane with two Rolls-Royce Eagle engines. In 1933 a Fairey monoplane with a Napier Lion engine flew from Cranwell to Walvis Bay, a distance of 5,341 miles, in 52hrs. 25 min., in the hands of Sqn. Ldr. O. R. Gayford and Flt. Lt. G. E. Nicholetts. Altitude records were achieved and broken again as engine development proceeded, until Flt. Lt. M. J. Adam attained 53,937ft. in 1937 on a Bristol Pegasus-engined monoplane. In 1938 long-distance records were achieved by a trio of Vickers-Wellesley monoplanes with special Bristol Pegasus XXII engines, which flew from Ismailia to Darwin non-stop, a distance of 7,162 miles. That remarkable record of endurance has never been broken.




(Above) Showing the steady increase in piston speed, 1922 to 1940. The dotted line illustrates the effect of dynamic loading for any given stroke, showing how engines have developed in the capacity of their moving parts, bearing surfaces, lubrication, etc.

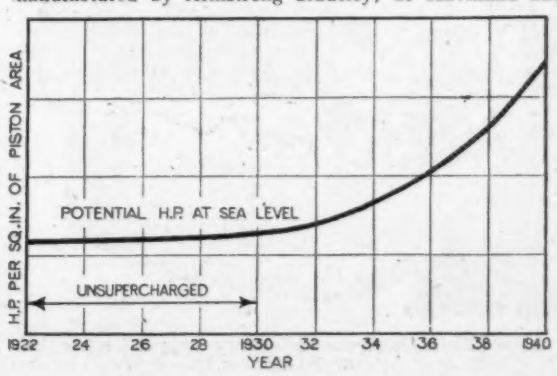
(Right) Showing increase with time in the theoretical full throttle potential power at sea level of standardised engines. The curve is plotted on the basis of horse power per square inch of piston area.

A spell of activity with diesel type engines, both air- and liquid-cooled, brought forth no revolutionary engine, but at one time the altitude record was held by a Westland biplane fitted with a Bristol Phœnix diesel engine. The advent of petrol of 87 and later 100 octane ratings offset many of the advantages that a C.I. oil engine offered, particularly for Service flying. Actually fuel improvements and supercharger progress permitting higher boost and cylinder working pressure, constitute the major advances of the period. These developments set problems for the metallurgical industry and plug manufacturers which were successfully surmounted by research and experiment.

Names prominent in the development of aircraft engines over the years include E. W. Hives and A. G. Elliott (Rolls-Royce); Sir Roy H. Fedden and L. F. Butler (Bristol); Frank B. Halford (de Havilland and Napier), and H. R. Ricardo, the noted research engineer.

In the development of special fuels of high octane rating Grp. Capt. F. R. Banks played a leading part during his term with the Ethyl Corporation.

Less than ten years ago the production of Service type aircraft engines was mainly centred around three firms: Rolls-Royce, Bristol and Napier. Trainer type engines were manufactured by Armstrong Siddeley, de Havilland and



## ENGINE PROGRESS, 1918-1943

Cirrus. When in 1934 war clouds began to be discernible, the Government was urged in these columns to expand facilities for engine production, and in 1935 *Flight* addressed an appeal to Lord Weir urging the need for immediate expansion of engine production facilities, and particularly stressed claims for a Scottish factory. In March, 1936, the Government announced that two companies, i.e., Austin and Rootes, had agreed to give the Government the benefit of their production experience, and in October, 1936, the shadow factory scheme was outlined and extended to six engine factories in the Midlands. The Bristol Mercury was the engine selected. This was a timely move which ensured the quantity of engine equipment which was to be so badly needed when the crisis came, as well as works personnel skilled in the practice of engine production.

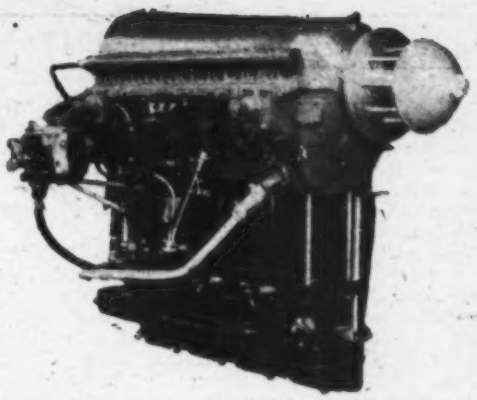
All-round progress in design has enabled the power developed for a specific capacity to be more than doubled during the lifetime of the R.A.F. To-day a normal-sized unit develops 1,000 h.p., and many engines exist which develop nearer 2,000 h.p. Progress proceeds apace on still larger sizes in multi-bank radials of eighteen or more cylinders, and H-, V- and X-types with twenty-four cylinders. Looking ahead, the 3,500 to 5,000 h.p. engine units with contra-rotating airscrews will be needed for the larger aircraft of the future. As an important competitor to the reciprocating engine the combustion gas turbine enters the aircraft arena in an advanced stage of development.

### The Increase of Engine Power

Thus from six-cylinder in-line engines, seven-cylinder radials and eight-cylinder V type unsupercharged units, the R.A.F. equipment has progressed to fully supercharged 9-, 14- and 18-cylinder air-cooled radials and twelve or twenty-four cylinder liquid-cooled engines of either V- or H-type. Moreover, apart from the great increase in unit size and power, four engines have become the rule on to-day's heavy bombers, in place of the single- or twin-engined installations fitted to bombers in the last war, a jump of something like 5,800 h.p.; that is from 700 h.p. to 6,500 h.p. A modern single-engined fighter actually has ten times the power that was available in the fighters of the year 1918.

In performance, operational reliability and the length of period between routine overhauls, the modern engine is far and away superior to earlier types despite its higher stressing and reduced weight per h.p. Engines were never so complete as they are to-day. A manufacturer supplies a self-contained unit equipped with all auxiliary drives and connections, arranged in an interchangeable mounting with efficient cowling ready for easy installation on the aircraft.

It has often been said with truth that racing improves the breed. Unquestionably aircraft and engine design have benefited from competitive events. To quote two instances only to prove the point. The Schneider Cup Trophy brought forward the remarkable S6B Supermarine seaplane —the basis of the redoubtable R.A.F. Spitfire. Applied to it was the Rolls-Royce "R" engine which developed 2,300 h.p. at 3,200 r.p.m. for a weight of 1,630 lb. = 11 ozs. per h.p.—the best result ever achieved. It had the same bore and stroke, 6in. × 6½in. as the Buzzard engine from which it was developed.



**Inverted 4-cylinder in-line de Havilland Gipsy Major of 130 h.p. which has powered so many trainers of the R.A.F. 1,260 hours are allowed between complete overhauls.**

The racing version was too light and frail for regular Service operation but for the specific purpose of the contest it proved ideal and succeeded in annexing the Trophy outright as well as beating world's speed records at 408.8 m.p.h. in the hands of R.A.F. pilots in 1931. It is questionable if the late Lady Houston was ever sufficiently credited for the immense technical progress her beneficence brought about in aircraft and engine design. Officialdom had decided against support for this event, and by stepping into the breach with financial aid, Lady Houston enabled concentration upon a major task which in a comparatively brief period was the means of advancing the science and progress of aeronautical design by several years.

In 1934 the London-Melbourne race for the MacArthur Trophy brought forward, among other notable aircraft and engines, the de Havilland Comet with two Gipsy engines which won the event comfortably. The present Mosquito with two Merlins is the direct descendant of the racing machine, having many design features in common.

Modern achievement will be more familiar to readers, the names of British aircraft and engines having become household words.

In view of the record of quality and achievement of British engines in every sphere, one may look forward with confidence to the future. Many important design innovations are being actively developed to-day and must remain subjects for future discussion. British technicians may be relied upon to maintain the proud position already attained in the aeronautical world.

## FRICTION

LAST week several announcements were made which caused some consternation in the aviation world. The first was that Mr. K. A. Layton-Bennett had been appointed controller of Short Brothers, following upon the recent retirement of Mr. Oswald Short from the chairmanship, and the appointment of Sir Frederick Heaton to that post.

Then came the somewhat startling announcement that "an order had been made under Regulation 78 of the Defence (General) Regulations, 1939, whereby all shares of every class in Short Brothers (Rochester and Bedford), Ltd., were on March 23, 1943, transferred to and vested in nominees of the Ministry of Aircraft Production."

On April 25th it was announced that Mr. Layton-Bennett had been appointed controller of General Aircraft, Ltd. In making the M.A.P. decision known to employees of General Aircraft, Ltd., Mr. E. C. Gordon England, managing director, announced that Mr. R. C. Rootes, deputy-chairman of Rootes Securities, Ltd., had been appointed technical adviser to Mr. Layton-Bennett.

While all this was going on, there came the announcement by Sir Archibald Sinclair that three directors had resigned from the board of British Overseas Airways Corporation. They were Mr. Clive Pearson (chairman), Mr. I. C. Geddes (deputy-chairman), and Mr. W. L. Runciman (director-general). The trouble arose through the refusal of the Air Ministry to allocate to the Corporation all the trunk routes except those carrying exclusively R.A.F. loads. The Corporation directors considered this essential, but the Air Ministry did not consider that the necessary flexibility in working with the newly formed Air Transport Command could be achieved in that way. As we go to press it is reported that employees of the Corporation have requested that Sir John Reith should be recalled to his old post of chairman. Previously, Sir Archibald had announced that Sir Harold Hewitt was to be temporary chairman, and had appointed Mr. Simon Marks and Mr. John Marchbank to the board.

## R.A.F. AIRCRAFT, 1918-1943

stage. Since then it has, of course, come into extensive use both as a fighter and as a fighter-bomber. The Bristol Beaufighter, with two 1,400 h.p. Hercules engines, is of more recent design, and is credited with a nominal maximum speed of 330 m.p.h. at 14,000ft. Quite recently reference has been made to the De Havilland Mosquito as a fighter, but no details may be divulged.

Army co-operation is a subject much to the fore nowadays, although its character has changed considerably from that visualised in peacetime, which dictated policy before the war. Mention has already been made of the fact that there were many variations of the Hawker Hart day bomber. These included the Audax biplane with Kestrel engine. This machine was used for many years on Army co-operation work. In more recent times a variant having the Napier Dagger 24-cylinder air-cooled engine was produced and used fairly extensively.

The Westland firm has for many years been closely associated with Army co-operation aircraft, the types ranging from the old Wapiti biplane with Jupiter engine, through the Wallace biplane with Pegasus, to the Lysander monoplane of the present day.

The link between the Royal Air Force and the Navy is formed by Coastal Command, which Mr. Churchill put under the operational control of the Admiralty some years ago. That Command has become one of our most important, and from using flying boats in the earlier days has added landplanes for much of its work.

Many different types are in use by Coastal Command, including some American. The British type designed specifically for torpedo-bomber-reconnaissance work is the Bristol Beaufort, a twin-engine monoplane with two 1,000 h.p. Bristol Taurus sleeve-valve engines. Other types have, however, been converted for torpedo carrying, including the Handley-Page Hampden and the Vickers Wellington, which were originally bombers. A still more recent adaptation to torpedo-carrying is the Beaufighter mentioned above.

Four firms have contributed to the development of the flying boat—Blackburn, Short, Saro and Supermarine. The Blackburn contribution comprised the Iris series, of which the Iris III had three Rolls-Royce Condor water-cooled engines, the Iris IV three Siddeley Leopard radial air-cooled, and the Iris V three Rolls-Royce Buzzard liquid-cooled.

The connection of Short Brothers with flying-boat work goes back to early days. During the period here reviewed that firm produced an impressive series, of which three went into fairly large-scale production: The Singapore II had four Rolls-Royce Kestrel engines in two tandem pairs; the Rangoon three Bristol Jupiters; and, finally, the Sunderland monoplane flying boat of modern times, with four Bristol Pegasus engines.

Saunders-Roe contributed the Saro London and Lerwick, the former a biplane and the latter a monoplane. From Supermarines came the Scapa and the Stranraer, both biplanes.

Although the Fleet Air Arm has now reverted to complete Admiralty control, and its aircraft are thus not, strictly speaking, any part of the Royal Air Force, the types produced during the early 'thirties were R.A.F., and should receive a brief mention.

The Fairey Seal was a three-seater version of the Gordon day bomber, the crew of three being deemed necessary in naval reconnaissance aircraft. The engine was an Armstrong Siddeley Panther radial air-cooled. The Seal had its Blackburn counterpart in the Shark, a T.S.R. (Torpedo-Spotter-Reconnaissance) type with Armstrong Siddeley Tiger engine. The Shark remained in service for many years.

Then followed the Fairey Swordfish, again a T.S.R. type, with Bristol Pegasus engine. The Swordfish is still in use.

Chronologically, the Blackburn Skua followed next. It was a two-seater naval dive-bomber with Bristol Perseus sleeve-valve engine, and was the first monoplane produced for naval use. It was designed to operate from carriers. A development of it was the Roc two-seater fleet fighter, equipped with a Boulton Paul multi-gun turret. The engine was the Perseus.

Reverting to the Fairey Company, the Albacore is a more modern type than the Swordfish, in that it has a cabin for its crew of two or three. It is a biplane, and is a T.S.R. type. The engine is a Bristol Taurus 14-cylinder sleeve-valve of about 900 h.p. The Fairey Fulmar is a monoplane two-seater fleet fighter developed from the Fairey P.4/34. It has the Rolls-Royce Merlin X engine of 1,145 h.p.

# CORRESPONDENCE

*The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.*

### BOMBER ESCORT

#### *Snags in the Glider Fuel Tank Idea*

MAJ. G. GREEN'S letter in your issue of March 18th is of much interest, but the plan proposed seems rather impracticable when examined in any detail.

Not a great deal would be gained either, and there are many disadvantages in the scheme. The cost of such a glider would also be considerable, no matter how simply it was constructed.

As a bomber escort the tug and glider would be subjected to the usual A.A. fire, and having a flying petrol tank just behind one is hardly conducive to good moral, to say the least. Difficulties in formation flying would also arise which, in themselves, would be sufficient to condemn the idea.

It might be useful for ferrying purposes and special long-range work at sea, but that is about all. "VIC."

### TAILPLANE DIHEDRAL

#### *It Improves Directional Stability*

IN reply to "Interested's" letter in your Correspondence columns (*Flight*, March 18th), I should like to state my views concerning the recent tendency towards the dihedralled tailplane.

The higher-powered motors, now in common use, with their consequent large torque, make "swing" during take-off a matter of increasing importance. The dihedralled tailplane, with its increased "lateral area" at the tail, gives an all-round improvement in directional stability, and offers, in part, a solution to this take-off difficulty. Again, a very obvious advantage is apparent in the case of marine aircraft when the dihedral lifts the tailplane (and outboard rudders, if any) out of the take-off spray.

The chief disadvantage would appear to be the increased complication in the elevator interconnection. Rigid interconnection of the elevators is an essential precaution against a particularly dangerous mode of tail-flutter in which differential movement of the elevators is coupled with torsion of the fuselage. Thus the usual light-alloy stiff tube connection must be replaced by some type of universal joint.

I should not imagine that there is any case against the dihedralled tailplane from the production point of view.

However, the decision as to whether it is worth while must lie with each individual designer. G. SIM.

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# A Quarter of a Century

Marshal of the Royal Air Force Viscount Trenchard. Chief of the Air Staff, January, 1919, to May, 1929.

## *Structure of the Royal Air Force from 1918 to 1943 : Born in War, Again in War : Reduction, Reorganisation, Expansion*

By MAJOR F. A. de V. ROBERTSON, V.D.

Air Chief Marshal Sir Charles F. A. Portal, the present Chief of the Air Staff since 1940.

THE Royal Navy became a regular Service under the Crown, I believe, in the days of King Henry VIII, and the Army in the days of King Charles II. In each case the regular Service became crystallised out of a previous rather haphazard system of raising temporary forces when war was impending. The Royal Air Force has a very different history. Like Pallas Athené, it sprang into life full-armed in a moment of time. The Air Force (Constitution) Bill received the Royal Assent on November 29th, 1917, and the Royal Air Force came into being on April 1st, 1918.

Its birth, therefore, took place in the throes of the first world war, and its twenty-fifth birthday finds the Royal Air Force again fighting desperately and triumphantly in the midst of the second world war. It is notable that in the first world war the R.A.F., as such, had only seven months of fighting ahead of it before the day of victory dawned. The space of time which lies between its twenty-fifth anniversary and the second day of victory cannot be foretold; but already the balance has been weighted on the side of righteousness, and the guilty foe knows that his doom is now sealed.

Looking back, we may speculate why it was thought necessary in 1917 to constitute a third fighting Service. Certainly in those days few men can have foreseen the lines upon which the Royal Air Force has since developed. The promoters of the Air Force (Constitution) Act could never have expected, for example, that within a few years the new Service would be entrusted with the defence and control of Iraq and Aden.

But certainly the position in the third year of the last war was not satisfactory, and in consequence the British war effort was not so concentrated as it could have been. The Army, it is true, was magnificently served by its Royal Flying Corps, but that Corps was never quite strong enough. It had had to borrow several fighter squadrons from the Royal Naval Air Service. Those squadrons, mostly flying the admirable Sopwith Triplane, did grand work, but it was an anomaly that they should have continued to belong to the Navy.

### Naval and Army Air Corps

The R.N.A.S. flying boats scoured the North Sea as earnestly as Coastal Command now patrols the seas all round the shores of the British Isles, and air squadrons of the Dover Patrol did yeoman service in the Channel. The latter force included night-bombing squadrons of Handley Page O/400 machines, which regularly bombed ports occupied by the Germans; but that could hardly be described as essentially work for the Royal Navy.

In other respects the R.N.A.S. was in a rudimentary condition, chiefly for technical reasons. Certainly the North Sea type of airships were invaluable for convoy work, but in some other respects there was more future promise than actual achievement about the R.N.A.S. Torpedo-carrying aircraft had scored some successes round the Dardanelles, but the class had not been developed. Float seaplanes were unreliable because the wooden floats were apt to break up in a heavy sea. It may be said that that will always be true, but the floats of those days were very fragile compared with those of the Seafox, which spotted for H.M.S. *Ajax* at the battle of the River Plate

Above all, carriers were still in an undeveloped state, and none was then able to take a useful place in the line when the fleet went into action. At Jutland *one* seaplane was sent out to reconnoitre. Reconnaissance was held to be the only function of aircraft with a fleet. The day for defence by fighters and attack with bombs and torpedoes on the enemy ships was not even in sight. Air power had not then become an integral part of sea power.

"Flight" photograph.

Cranwell College, which started in 1922 as a camp of wooden huts.

## A QUARTER OF A CENTURY

The chief reason for the amalgamation of the R.F.C. and the R.N.A.S., however, was the question of supply. The Admiralty and the War Office were competing with each other to get deliveries from the manufacturers, and the latter, for various reasons, preferred doing business with the Admiralty. A concentration of air effort had obviously become necessary, and the result was the Royal Air Force. The change was welcomed by the men of the R.F.C. and rather resented by those of the R.N.A.S.

As a Service, the Navy perhaps gets a tighter grip on a man's affection than the Army is able to do, probably because in the Army loyalty is chiefly given to a regiment or corps rather than to the whole Service. It should be noted that the Royal Air Force has followed the pattern of the Navy, and a man in either of these Services is not permanently posted to one ship or one squadron.

Of course, when the R.A.F. was constituted, every officer and man was given a free choice as to whether he would transfer to it or would remain in his original Service, whether Navy or Army. To refuse to transfer would have cut the man off from all connection with flying, and consequently there were few or no refusals. Once a man has become devoted to the air he will never give it up.

Of the last seven months of the last war only one incident need be noted. The Air Ministry asserted its separate existence by an effort to make war on its own account. It formed the Independent Air Force, and sent it to France to bomb the Rhine towns. This force was not placed under the operational control of Lord Haig, the Commander-in-Chief of the British Army, though it was under the orders of Marshal Foch as Generalissimo of the Allied armies in the West.

The Independent Air Force was a precursor of the present Bomber Command, but the wisdom of independent air action at that time is open to doubt. There were occasions when it would have been wiser to leave German production alone, and use every available bomber to strike at the last great German land offensive. In the present year the Air Staff has proclaimed that when the British Army again lands in Europe it shall have the help, not only of Army Co-operation Command, but of all possible squadrons of the Royal Air Force.

### Drastic Reduction

After the Armistice some squadrons remained on the Rhine with the Army of Occupation, but there was a general demobilisation of the Air Force as well as of the Army. The Foreign Office declared that there was no likelihood of a war for at least ten years, and successive British Governments proceeded to cut down the armed forces in the double cause of economy and pacifism. It proved most expensive economy—expensive in money, in lives, and in honour.

With Sir Hugh (now Viscount) Trenchard as Chief of the Air Staff the work of moulding the new Service and setting it on a firm foundation was taken seriously in hand. At the time of the Armistice the force consisted of 28,000 officers and 264,000 airmen. Most of the pilots wanted to continue flying, and so the Air Ministry could pick and choose. Some of the senior officers held

## FIVE MORE CHIEFS OF THE AIR STAFF

Marshal of the Royal Air Force Sir Edward L. Ellington, May, 1933, to August, 1937.

Marshal of the Royal Air Force Sir Cyril L. N. Newall, September, 1937, to October, 1940.

The late Air Chief Marshal Sir William Geoffrey H. Salmond, April 1st, 1933, died April 27th, 1933.

Marshal of the Royal Air Force Sir John Maitland Salmond, January, 1930, to May, 1933.

Major General Sir Frederick Hugh Sykes, April, 1918, to March, 1919.

Air Chief Marshal Sir Arthur Tedder, who was A.O.C.-in-C. Middle East during the capture of Libya and Tripolitania by the Eighth Army.

Air Marshal Sir Arthur T. Harris, who as A.O.C.-in-C. Bomber Command now rules the air offensive against the Axis.

Air Chief Marshal Sir Hugh Dowding, who will always be remembered as A.O.C.-in-C. Fighter Command during the Battle of Britain.

permanent commissions in the Navy or Army, and the rest held only temporary commissions.

Permanent commissions in the Royal Air Force were a new thing, and they were first granted on August 1st, 1919. As the Government had decided that all defence expenditure had to be kept down to a minimum, the first batch of permanent commissions granted numbered only 1,065.

### Titles of Rank

At first the titles of rank were the same as those of the Army—Generals, Colonels, etc.—because the numbers in the R.F.C. had greatly exceeded those of the R.N.A.S. in April, 1918. No objection was raised by the R.N.A.S. officers; in fact, a naval Lieutenant who suddenly found himself a Captain was unfeignedly delighted, for to the naval mind, of course, Captain denotes a very exalted rank.

Somebody or other, probably a committee, was set to work to devise distinctive titles of rank for the new Service. The task was admittedly difficult, for nobody wanted to resuscitate classical words, such as taxiarch or centurion, and at the same time nobody felt inclined to invent absolutely new words.

The result of the committee's labours can hardly be acclaimed as pleasing, for not one title in the R.A.F. consists of a single word. Each rank is described by at least two words, which is a clumsy state of affairs, while the terrific mouthful of "Marshal of the Royal Air Force" is a title in which for quite a long time people absolutely declined to believe. Most people have heard the story of the housemaid who enquiried of the visitor, "What name, Sir?" and when told "Air Vice-Marshal Sir Robert Brooke-Popham" is alleged to have thrown open the drawing-room door and announced "Air Popham." However, these titles of rank have come to stay, and the public admiration for the R.A.F. has partially overcome the distaste for double-barrelled titles.

During the last war and at the time when permanent commissions were first granted, most pilots were officers. There had been some sergeant pilots, among them Sgt. T. Mottershead, who was awarded a posthumous Victoria Cross, while Major McCudden, also a V.C., had flown as a sergeant before he was granted a commission, but these were exceptional cases. It was the general rule that a pilot should be an officer, though the reason for that rule is not easy to discover. The present war has shown how very good airmen pilots can be.

But if pilots were to be officers, then some special arrangement was necessary. It was obviously impossible to grant permanent commissions to all the pilots who were needed, even in the tiny Air Force of 1920, and so the system of short-service commissions was introduced. Under this system a man engaged to serve for ten years, some of them (the number was changed several times) on full-time duty and the rest on the reserve.

Certainly a reserve was a necessity, and this was one way of creating one; but the short-service commission could hardly be called a good bargain for a young man. None the less, it attracted sufficient numbers. Flying has an irresistible attraction for British youth, and many jumped eagerly at the prospect of so many years in the R.A.F., and as for what they should do to earn their living afterwards, they declined to jump that hurdle until they came to it. No doubt they were improvident, but their improvidence was a great boon to the R.A.F.

Air Chief Marshal Sir Philip Joubert de la Ferté, who commanded Coastal Command during a long period of the war. He is now Inspector-General of the R.A.F.

At a later date civilians were also allowed to join the R.A.F. Reserve as officers, and were taught to fly at Government expense. A few years before the present war broke out a new body was formed, the R.A.F. Volunteer Reserve, for civilian entrants. In the V.R. the men had to sign on as sergeants, unless they held a proficiency certificate from one of the university air squadrons, in which case they were granted commissions.

Another way of tapping civilian enthusiasm was the formation, in 1925, of the Auxiliary Air Force, with complete squadrons attached to various important cities. The A.A.F. proved a very good investment.

Besides a reserve, a fighting Service needs a cadet college and a staff college. No time was lost in providing both. In 1922 the cadet college

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was started at Cranwell, in Lincolnshire, an old R.N.A.S. station once known as H.M.S. *Daedalus*.

Cranwell was organised on the same lines as Sandhurst and Woolwich, and it provides the bulk of permanent officers for the Royal Air Force. The remainder, a small minority, are drawn from approved universities or by commissions granted to selected airmen. Every officer from Cranwell can expect, in the normal course of events, to make the Air Force his life's career, and to rise to high rank in it, with a correspondingly comfortable pension on retirement. The first Commandant of Cranwell was Air Commodore C. A. H. Longcroft. For many years Cranwell was a separate Command directly responsible to the Air Ministry.

Here it may be mentioned that promotion in the Air Force from Pilot Officer to Flying Officer, and from Flying Officer to Flight Lieutenant is a matter of time, and in peace works automatically, provided that the officer gives satisfaction. But from Flight Lieutenant upwards promotion is by selection, for the R.A.F. believes in bringing its best men to the top as early as possible.

### Apprentices' Schools

The R.A.F. Staff College made an equally unpretentious start. It commenced its career in wooden huts at Andover in 1922, and its first Commandant was Air Commodore Brooke-Popham.

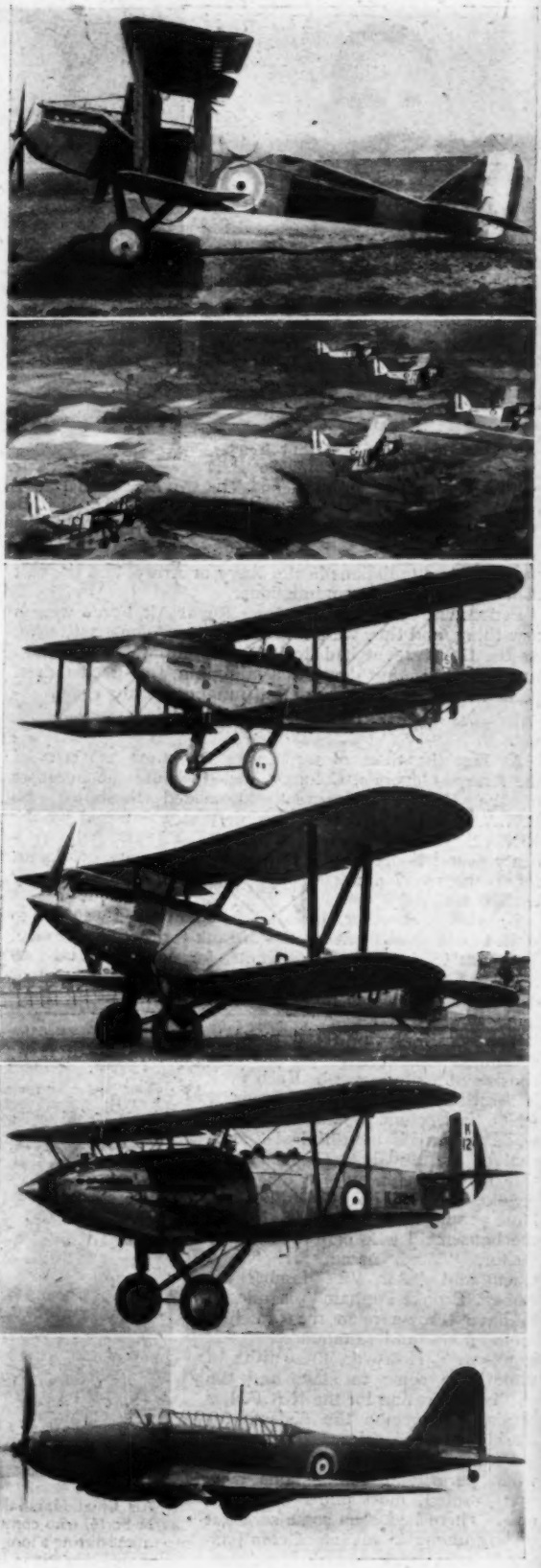
These two colleges were formed on the model of Army institutions, but schools of technical training for aircraft apprentices are things peculiar to the Royal Air Force. Originally there were two such schools, one at Halton for fitters, armourers, and other trades, and a second one for wireless operator mechanics and instrument makers. The latter was first located at Flower Down, but was afterwards transferred to Cranwell.

Work on aircraft and their accessories is more exacting than ordinary mechanical work, and the Air Ministry from the start believed that the right thing to do was to catch its mechanics young and train them up in the way it would have them go. So lads between 15 and 17 were accepted at these schools and given a thorough education, both mechanical and general, for three years. The apprentices undertook to serve in the R.A.F. for 12 years, from the age of 18 up to that of 30. The results have thoroughly justified this unique experiment. Halton was also an independent Command.

The policy from the very first was that, while the Air Force must be small, it must also be good. In training and in equipment only the best was considered good enough. In this way a nucleus of the highest standard was formed on which it was a straightforward matter afterwards to expand.

But that nucleus was at first pitifully small. Eight squadrons were allotted to India, seven to Egypt, three to Iraq, while in the Mediterranean there was one flight of seaplanes at Malta and another at Alexandria. There was also a seaplane carrier with the Mediterranean Fleet, but soon aircraft carriers with flight decks became available. In those early days the R.A.F. provided the whole personnel for the flying branch of the Navy, observers as well as pilots, and, of course, aircraftmen.

Within the British Isles there were the Inland Area and



**SIX SINGLE-ENGINED DAY BOMBERS. Reading from the top downwards. The 240 h.p. Siddeley Puma-engined D. H. 9 of 1918. The Westland Wapiti (Bristol Jupiter) which was originally designed to use up D. H. 9 spares. Next, the mark F of the famous Fairey III series which started in the early 1920's and went on for some 15 years. Third from the bottom is the Fairey Fox, which had the Curtiss D.12 (Felix) engine, and under this is the Hawker Hart (R.R. Kestrel) which appeared in service in 1930. In various specialised forms it appeared under no fewer than seven different names. Finally, at the bottom, is the R.R. Merlin-engined Fairey Battle, which was made in vast quantities in shadow factories in 1940.** *"Flight" photographs.*

# A QUARTER OF A CENTURY

the Coastal Area. The latter administered the flights of flying boats (they only became squadrons at a later date) and all the personnel and equipment supplied to the Navy. The Inland Area dealt with bomber and fighter squadrons, Army co-operation squadrons, stores depots, and training schools other than Cranwell and Halton.

The year 1922 saw a momentous step taken. Iraq was then a mandated territory, and the Army was responsible for its external and internal safety. The R.A.F. squadrons there were under military control, and the cost to the British taxpayer was inexcusably high. In 1922 Mr. Winston Churchill arranged that Iraq should be entrusted to the Royal Air Force, and that such Army units as were left there should be placed under the Air Officer Commanding. Sir John Salmond was chosen as the first A.O.C. Most of the regiments were withdrawn, thereby effecting a most substantial economy, while the R.A.F. proved amply capable of maintaining internal order, as well as of driving off foreign intruders. Its squadrons were assisted by companies of armoured cars raised and equipped by the Air Ministry and manned by Air Force personnel. A similar arrangement at Aden in 1928 also proved a great success, but there was a failure in Palestine and Transjordan, which had to be handed back to Army control. Aircraft cannot quell riots in crowded towns.

The R.A.F. was responsible for another fruitful innovation in Iraq, even before it was placed in charge of the peace of the country. This was the air mail between Baghdad and Cairo, which was run by the bomber-transport machines, Vernons and Victorias, from June, 1921, until 1927, when Imperial Airways took over the business.

In 1923 the Government laid down a programme of raising the strength of the R.A.F. in the United Kingdom to 52 operational squadrons. At the time it consisted of only 34 squadrons. This programme was never fulfilled. The Force was still well short of this modest maximum when the international situation and Hitler's aggressive attitude forced Britain to set in hand a much more drastic programme of expansion. However, the 1923 programme is interesting in one way. It provided for 35 squadrons of bombers and 17 of fighters.

### Bomber and Fighter Squadrons

The Air Staff has always believed in the offensive, and at that time it took an unduly low view of the possibilities of air defence. The doctrine was that, as Mr. Baldwin said when Prime Minister, the bomber would always get through. Consequently, two belligerents would bomb each other until the greater sufferer squealed for mercy and surrendered. It is really amusing in 1943 to look back and realise that apparently responsible authorities ever held that view. *Flight* never subscribed to it.

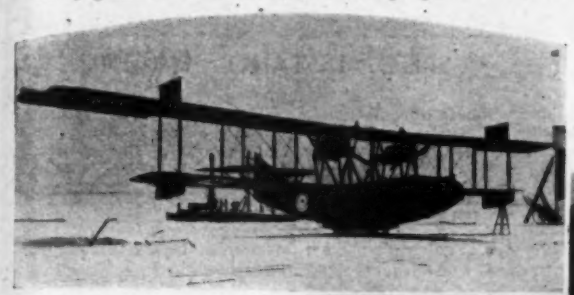
The theory of bomber supremacy received some specious support from the technical progress of those days. Until the production of the Rolls-Royce Kestrel engine in 1927 it had been the rule in the R.A.F. that all bombers should have water-cooled engines, and all fighters should be driven by air-cooled radials. The bombers depended mainly on the Napier Lion and the American Liberty; the fighters on the Bristol Jupiter and the Siddeley Jaguar.

In 1923 the Schneider Trophy race was won by an American Navy seaplane driven by a Curtiss D12 water-cooled engine with small frontal area. The Fairey Aviation Co. acquired the rights of this engine (which in Britain was named the Felix), and round it they designed the Fox bomber. No. 12 (Bomber) Squadron—which afterwards won immortal glory over the Maastrict bridges—was equipped with the Fox, and in the ensuing Air Exercises no fighter of that day could catch the Foxes.

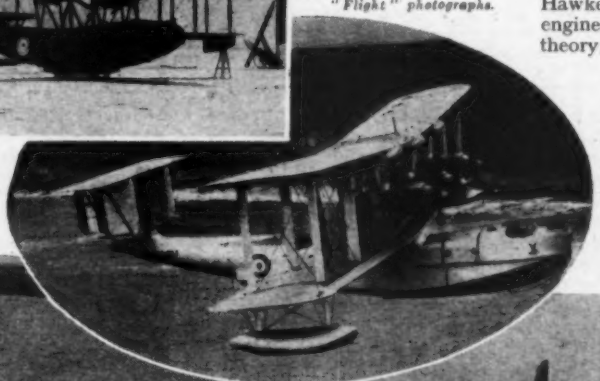
It seems strange now that people should not have realised that, when good designers put their minds to it, it is always possible to produce a fighter which can outfly any bomber. But nobody built a fighter round the Felix engine, and bomber supremacy became a fashionable creed. The Demon and the Fury, two Hawker fighters driven by Kestrel engines, might have shaken that theory, but it persisted for years. But in the 'twenties radio-location had not been discovered.

In 1925 Sir John Salmond came home from

*"Flight" photographs.*

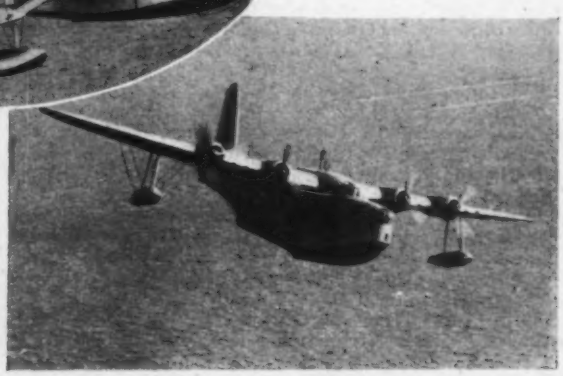


(Above) One of the F5 flying boats (two 375 h.p. R.R. Eagle VIII engines) which were used in 1918.



(Left) A Blackburn Iris III (three 650 h.p. R.R. Condor engines) flying along the Devon coast in 1931.

Supermarine Southamptons (two 450 h.p. Napier Lions) in formation (1930). These had metal hulls, but earlier models were made of mahogany.



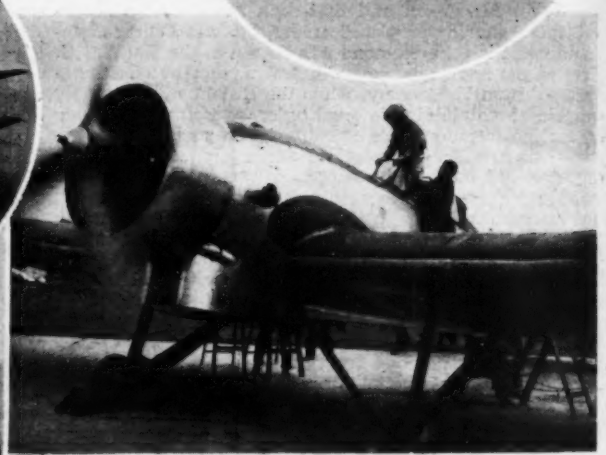
The Short Sunderland (four 950 h.p. Bristol Pegasus engines) has proved an exceptional military boat, and has given outstanding service in the hands of Coastal Command pilots.

(Left) The Rolls-Royce Supermarine S6B which won the Schneider Contest in 1931, after the S6 had won in 1929.

(Right) The Napier Supermarine S5 which took the Schneider Trophy from the Italians at Venice in 1927.

"Flight" photographs.

# R.A.F. GOES OUT FOR RECORDS



## SPEED, DISTANCE, HEIGHT

(In circle) The three Vickers Wellesleys, Bristol Pegasus XXII engines, which in November, 1938, flew from Ismalia in Egypt to Port Darwin in Australia, a distance of 7,162 miles in 48 hours, beating the existing world's long-distance record by 856 miles. (Bottom left) The Napier Lion-engined Fairey monoplane which flew from Cranwell in Lincolnshire to Walvis Bay in 1932, a distance of 5,341 miles in 57 hrs. 25 mins. (Bottom right) In 1937 Flt. Lt. M. J. Adam took the world's height record of 53,937ft. on a Bristol 138 monoplane fitted with a special Pegasus engine which had a two-speed supercharger. Flt. Lt. Adam is seen wearing his pressure suit as he gets into the cockpit.

## A QUARTER OF A CENTURY

Iraq and was at once put in charge of another new Air Force development. This was the Command known as Air Defence of Great Britain, and it was divided into Bombing Area and Fighting Area. Inland Area thenceforth concerned itself only with the depots, flying training schools, and the army co-operation squadrons. Sir John was given the position of Air Officer Commanding-in-Chief—the first time such a term had been used in the Air Force. It may be remarked here that the powers and dignity of an officer Commanding-in-Chief are less than those of a Commander-in-Chief, but it would take a jurist to explain the difference.

Thenceforward Air Exercises were held every summer, the Bombing Area acting as the enemy and the Fighting Area as the defenders. The latter did not merely comprise all the fighter squadrons, but had operational control over the Observer Corps (whose members were then enrolled as Special Constables) and also over the Searchlight Battalions and Anti-aircraft Brigades of the Territorial Army. The exercises were of the utmost value to the searchlight crews.

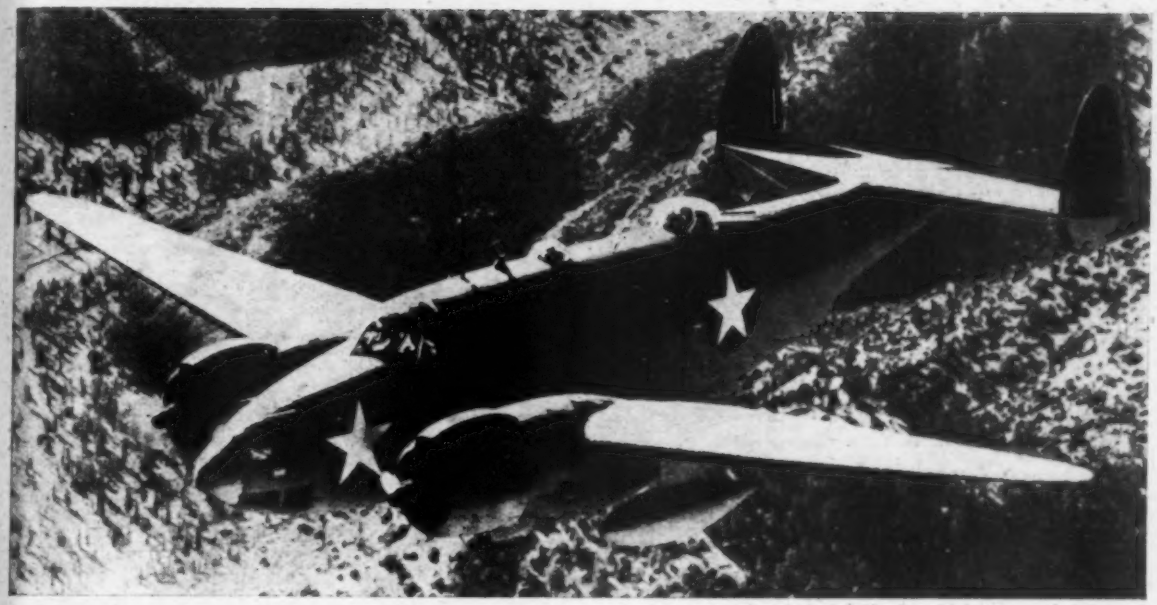
Other lessons were taught by the Air Exercises. Heavy bombers (Vickers Virginias in those days) had been considered only as night bombers. But in 1930 the A.O.C., Bombing Area, used his Virginia squadrons for a long-range raid by day, with great success.

In selecting types of aircraft one policy prevailed for the Air Force at Home, and quite a different one for the Overseas Commands. Previous to the Italian invasion of Abyssinia there was no need to keep fighter squadrons overseas. What was considered best in the Middle East, Iraq and India was a general-purpose type (special mention may be made of the Westland Wapiti) which, with minor divergencies in fittings and equipment, could be used by light bomber squadrons and by army co-operation squadrons. The Middle East and Iraq also possessed a few squadrons of bomber-transport aircraft, mainly of Vickers design.

Mention has been made above that at first all the personnel and machines on aircraft carriers (apart, of course, from the ship's naval company) were provided by the R.A.F. In 1923 a committee, presided over by Lord Balfour, decided that all the observers in carrier-borne aircraft should be naval officers, while of the pilots 70 per cent. should be naval officers holding temporary commissions in the R.A.F. This was a typically British compromise which satisfied nobody, and in 1937 the Fleet Air Arm was handed over entirely to the Admiralty. It is, therefore, not directly concerned with the 25th birthday of the R.A.F.

The above is but a brief outline of a quarter of a century of hard work and steady progress. When Germany became dangerous an expansion programme was undertaken, and at the same time the whole force had to be re-equipped with monoplanes. The organisation into Areas gave place to one of Commands, and most Commands were placed under Air Officers Commanding-in-Chief.

Since the present war broke out in September, 1939, the R.A.F. has developed much and undergone many changes. It only remains for *Flight*, and, of course, all its readers, to wish the Royal Air Force many happy returns of April 1st.



The U.S. Navy's anti-submarine version of the Ventura. It can carry both depth charges and torpedoes. Long-range fuel tanks can be seen under the wing.

# SERVICE AVIATION

## *Royal Air Force and Fleet Air Arm News and Announcements*

### *Promotions*

GENERAL DUTIES BRANCH

Air Comdres. to Acting Air Vice-Marshals:—

A. H. ORLEBAR, C.B.E., A.F.C. March 1st, 1943.
E. A. B. RICE, C.B.E., M.C. February 24th, 1943.
R. HARRISON, C.B.E., D.F.C., A.F.C. February 27th, 1943.

Air Comdre. (temp.) W. M. YOOL is granted the rank of Group Capt. (war subs.), January 15th, 1943.

TECHNICAL BRANCH.

Air Comdre. (temp.) E. D. DAVIS, O.B.E., is granted the rank of Air Comdre. (war subs.), January 27th, 1943.

Air Comdre. (temp.) T. A. WARNE-BROWN, D.S.C., is granted rank of Group Capt. (war subs.), January 1st, 1943.

### *Awards*

#### *Fleet Air Arm*

THE KING has been graciously pleased to approve the following awards for bravery and skill in the hazardous operations in which the Allied Forces were landed in North Africa:—

**Bar to Distinguished Service Cross**

Temp. Sub. Lt. (A) L. P. TWISS, D.S.C., R.N.V.R.

**Mention in Despatches (Posthumous)**

Lt. (A) J. V. HARTLEY, R.N.
Ldg. Airman G. DIXON.

#### *Royal Air Force*

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

**Distinguished Service Order**

Act. Flt. Lt. P. A. MACKENZIE, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since being awarded the D.F.C., this officer has participated in numerous successful sorties. One night in January, 1943, he piloted an aircraft detailed to attack Berlin. Whilst crossing the coast on the homeward flight his aircraft was subjected to heavy and accurate anti-aircraft fire. Two of the aircraft's engines were damaged and rendered unserviceable. Height was lost but, although faced with a 300-mile flight over the sea, Flt. Lt. MacKenzie continued his homeward journey. When half-way across the water a third engine became overheated. The aircraft was now down to 600 feet, and the situation appeared hopeless, but Flt. Lt. MacKenzie, displaying grim determination, flew on at this height, and eventually reached this country, where he landed the damaged aircraft.

F/O. C. A. CROMBIE, R.A.A.F., No. 176 Sqn.—As pilot and observer respectively F/O. Crombie and W/O. Moss have flown together in many night flying operations in the United Kingdom, the Middle East and in India. They have destroyed eight enemy aircraft and damaged another. One night in January, 1943, they destroyed two of a formation of four Japanese aircraft before being compelled to abandon their own aircraft, which was set on fire during the engagement.

Sqn. Ldr. J. E. Walker, R.C.A.F., No. 243 Squadron, who has been awarded a Bar to his D.F.C.

**Bar to Distinguished Flying Cross**

Act. F/O. L. P. S. BING, D.F.C., R.C.A.F., No. 89 Sqn.—Since being awarded the D.F.C. this officer has continued to display great courage and skill. He has now taken part in the destruction of eleven enemy aircraft at night. On a recent occasion the aircraft in which he was flying was forced to descend on the sea and it was 2½ hours before F/O. Bing and his pilot were rescued.

**Distinguished Flying Cross**

W/O. R. C. MOSS, No. 176 Sqn.—For citation see F/O. Crombie.

F/O. D. A. C. BLAKELEY, R.A.F.V.R., No. 500 Sqn.—F/O. Blakeley has participated in many and varied missions, including anti-submarine patrols and attacks on enemy harbours and shipping. One day he sighted two U-boats and made spirited and accurate attacks with machine guns on both vessels. Later, in November, 1942, he was detailed as personal pilot to General Giraud for a few days. In the same month when flying at 5,000 feet he sighted a fully surfaced U-boat five miles away. He dived to attack, and despite heavy fire from the enemy, straddled the vessel with depth charges and then attacked with machine gun fire until the submarine disappeared.

F/O. E. T. JOHN, No. 114 Sqn.—This air observer has a fine record of service in operations against the enemy in France, Germany and North Africa. He has consistently displayed skill in locating his targets, both by day and night.

F/O. I. R. MITCHELL, R.N.Z.A.F., No. 500 Sqn.—F/O. Mitchell was the navigator of an aircraft engaged on anti-submarine duties when a U-boat was sighted. He immediately attacked the vessel as it was submerging and inflicted serious damage. Four days later F/O. Mitchell was again navigator of an aircraft which so damaged an enemy U-boat that the vessel was beached. During the attack his aircraft sustained serious damage and it was largely due to this officer's tenacity and initiative that the aircraft was flown safely back to base. On later occasions F/O. Mitchell participated in determined attacks on U-boats.

F/O. H. A. POOLE, R.N.Z.A.F., No. 500 Sqn.—Since May, 1941, this officer has flow on many operational duties which have involved attacks on enemy shipping, patrols along the Dutch coast, and anti-submarine duties in the North Atlantic, the Bay of Biscay, and the Mediterranean Sea. He has made several successful attacks on enemy

# SERVICE AVIATION

U-boats and has also damaged a Ju 88 which was attempting to shadow a convoy.

F/O. A. SCHOLEFIELD, R.A.F.V.R., No. 608 Sqn.—This officer completed a strenuous and exceptionally successful tour of operational flying before being posted to Africa. He was employed for 12 months on sorties and patrols off the Norwegian and Danish coasts, where he encountered heavy opposition. In operations on North Africa F/O. Scholefield has flown over 125 hours. On one occasion, while flying on an anti-submarine sweep, he sighted a fully surfaced Italian submarine. He made a skilful and accurate attack and seriously damaged the vessel.

F/O. R. F. C. SHARMAN, R.A.F.V.R., No. 225 Sqn.—This officer has piloted aircraft in tactical reconaissance operations for the Army and has brought back valuable information. On a number of occasions he has encountered heavy enemy fighter opposition which he has evaded by skilful flying. During one sortie he was attacked by several Me 109s, almost at ground level, and, despite determined attempts to evade the attacks, his aircraft was shot down. Although F/O. Sharman was badly shaken, he reported back to base some 70 miles distant, the same day. Since this experience his chief concern has been to resume operational duties.

### *Three U-boats*

F/O. J. H. SIMPSON, R.A.F.V.R., No. 500 Sqn.—F/O. Simpson has taken part in a large number of patrols and convoy escorts in the North-Western approaches, the Bay of Biscay, and in the North African campaign. He was captain of an aircraft on an anti-submarine patrol in the Mediterranean, when he sighted a fully surfaced U-boat. He immediately attacked and damaged the vessel. A few days later he observed another U-boat being attacked by other aircraft of his squadron and joined in the attack despite heavy fire from the enemy. The submarine eventually beached. F/O. Simpson's attacks materially contributed to this result. Again, two days later, he sighted a U-boat and made a skilful and accurate attack, causing considerable damage to the submarine.

P/O. R. J. H. ROBERTSON, R.A.F.V.R., No. 72 Sqn.—P/O. Robertson has flown continuously on operations since December, 1941, and has destroyed at least six enemy aircraft.

P/O. L. E. SHORT, R.A.A.F., No. 500 Sqn.—This officer has flown on a large number of anti-submarine patrols in the North Western Approaches, the Bay of Biscay and in the Mediterranean. In August, 1942, he was the navigator in an aircraft which was forced down in a very heavy sea. His calmness and resolution undoubtedly helped to save the crew. During September, 1942, when returning from an anti-submarine patrol in the Bay of Biscay in very heavy weather, P/O. Short successfully navigated his aircraft back to base, although many of his instruments were unserviceable. On three occasions he successfully attacked enemy submarines, causing considerable damage.

W/O. H. W. CHARNOCK, D.F.M., No. 72 Sqn.—W/O. Charnock is a section leader of distinction who has at all times shown great keenness to engage the enemy. He has participated with much success in numerous low-level attacks against enemy transport and has destroyed at least six hostile aircraft.

Sqn. Ldr G. H. DENHOLM, No. 236 Sqn.—In January, 1943, this officer was detailed to undertake a shipping reconnaissance off the Norwegian coast. In spite of extremely adverse weather, Sqn. Ldr. Denholm completed his mission successfully, bringing back important information. Later in the month he completed two operational missions demanding a high degree of skill and fortitude.

F/O. E. E. JEFFREYS, R.A.F.V.R., No. 236 Sqn.
F/O. R. A. IRVING, R.A.F.V.R., No. 236 Sqn.—In January, 1943, F/Os. Jeffreys and Irving were pilot and navigator respectively of an aircraft engaged on a shipping reconnaissance over enemy waters. In spite of adverse weather success was achieved and valuable information obtained. On a further two sorties later in the month they displayed great fortitude and devotion to duty.

Flt. Lt. K. H. BURNS, No. 61 Sqn.—Flt. Lt. Burns and Flt. Sgt. McAvoy have flown together as captain and navigator on a number of operational sorties, including a reconnaissance of Turin from a height of 500 feet. In January, 1943, they took part in a raid on Berlin, and after releasing their bombs in the target area obtained an excellent photograph.

Flt. Lt. H. G. EDWARDS, No. 89 Sqn.—Flt. Lt. Edwards has displayed exceptional ability during night flying operations and has destroyed five enemy aircraft. During July and August, 1942, twenty-two enemy aircraft were destroyed by a detachment of his squadron while under his command.

Act. Flt. Lt. J. F. EDWARDS, D.F.M., R.C.A.F., No. 260 Sqn.—In December, 1942, Flt. Lt. Edwards was commander of a formation engaged in patrol duties over our forward troops. During the flight, ten enemy aircraft were encountered and Flt. Lt. Edwards destroyed one of five which were shot down. Two days later he destroyed another hostile aircraft, bringing his total victories to eight.

F/O. N. E. REEVES, R.A.F.V.R., No. 89 Sqn.—Since his arrival in Malta this officer has destroyed five enemy aircraft during darkness, and another in daylight, bringing his total victories to seven aircraft destroyed.

F/O. M. C. SHIPARD, R.A.A.F., No. 89 Sqn.—F/O. Shipard has always shown great courage and devotion to duty. While serving in Malta his keenness to participate in operational flying has been a splendid example to all air crews. He has destroyed four enemy aircraft by night.

### *Home on One Engine*

F/O. J. N. W. YOUNG, R.A.F.V.R., No. 89 Sqn.—In January, 1943, this officer was detailed to make an attack on enemy road transport in Tunisia. During the raid, anti-aircraft fire severely damaged the port engine of his aircraft and destroyed the dinghy. Undeterred, F/O. Young proceeded with his mission and successfully machine-gunned transport and attacked a convoy before returning to base two hundred miles away, which he reached safely although his port engine had failed completely.

W/O. A. A. O'LEARY, D.F.M., No. 89 Sqn.—During night flying operations this observer has taken part in the destruction of at least seven enemy aircraft.

W/O. C. T. PHILLIPS, No. 176 Sqn.—On his first operational flight in the Far East W/O. Phillips, as observer, and Flt. Sgt. Pring, as pilot, co-operated in the destruction of a formation of three Japanese aircraft within four minutes. W/O. Phillips and Flt. Sgt. Pring have completed numerous operational sorties, in the course of which they have displayed outstanding skill and courage. Flt. Sgt. Pring has destroyed a total of six enemy aircraft, while W/O. Phillips has taken part in the destruction of eight enemy aircraft at night.

Act. Flt. Lt. C. P. REED, No. 85 Sqn.—As observer this officer has completed a large number of hours flying on night operations. He has displayed great skill and keenness and participated in the destruction of two enemy aircraft and the damaging of three others.

W/O. W. N. ADDISON, D.F.M., No. 85 Sqn.—This airman is an observer of high merit. Since being awarded the D.F.M. he has participated in the destruction of three enemy aircraft at night.

**Air Marshal Sir A. Sheridan Barratt, K.C.B., C.M.G., M.C., A.O.C. in C. Army Co-operation Command, with the Chief of Air Staff, Air Chief Marshal Sir Charles Portal, during the recent offensive exercises.**

## Conspicuous Gallantry Medal (Flying)

Flt. Sgt. L. B. WALLACE, R.N.Z.A.F., No. 81 Sqn.—One night in December, 1942, this airman was the wireless operator of an aircraft detailed to attack Munich. On the outward flight the aircraft was intercepted by an enemy fighter and subjected to a number of attacks. In the first, which was made directly from beneath the bomber, the bomb aimer was seriously wounded, while Flt. Sgt. Wallace received a bullet wound in the leg. Some flares inside the aircraft were set alight, while the matting on the floor below the mid-upper gunner's turret and everything inflammable in close proximity became ignited and commenced to burn furiously. Despite his injury, and with complete disregard for danger, Flt. Sgt. Wallace immediately attempted to quell the flames. The heat and stifling fumes compelled him to desist several times, but, undaunted, he jettisoned all moveable burning material through the rear turret, and finally subdued the fire. On the homeward flight, Flt. Sgt. Wallace displayed great skill in obtaining fixes, sending signals and doing everything in his power to assist his pilot in flying the damaged aircraft back to this country.

## Bar to Distinguished Flying Medal

Flt. Sgt. D. A. OXBY, D.F.M., No. 89 Sqn.—Flt. Sgt. Oxby has displayed exceptional keenness and devotion to duty, and high technical skill and courage; he has taken part in the destruction at night of thirteen enemy aircraft.

## Distinguished Flying Medal

Flt. Sgt. J. K. MCAVOY, R.C.A.F., No. 61 Sqn.—For citation see Flt. Lt. Burns.

Flt. Sgt. A. M. O. PRINO, No. 176 Sqn.—For citation see W/O. Phillips.

Flt. Sgt. F. W. CURTIS, No. 89 Sqn.—Flt. Sgt. Curtis has shown outstanding keenness and devotion to duty over a long period. He has taken part in the destruction of four enemy aircraft at night.

Flt. Sgt. J. M. DEMPSTER, R.C.A.F., No. 57 Sqn.—As air gunner, this airman has participated in numerous sorties, including an attack on Berlin and daylight raids on Le Creusot and Milan. One night in December, 1942, during a flight to Duisburg, Flt. Sgt. Dempster shot down an enemy fighter which attempted to attack his aircraft. One night in January, 1943, he took part in an attack on Essen. During the return flight his aircraft was attacked by an enemy fighter, but Flt. Sgt. Dempster drove it off with devastating fire, which caused it to fall towards the ground with one of its engines alight.

Flt. Sgt. W. E. STEWART, R.C.A.F., No. 260 Sqn.—This airman has participated in a large number of bombing and low level machine gun attacks, in which considerable damage has been inflicted on the enemy. Flt. Sgt. Stewart has destroyed one and assisted in the destruction of another hostile aircraft.

THE KING has been graciously pleased to approve the following awards:—

## M.B.E. (Mil.)

Lt. A. KINGON, S.A.A.F.—In December, 1941, this officer was pilot of an aircraft which was attacked by fighters while over the enemy lines, and the port engine was set alight. The observer was able to escape by parachute, but both gunners were seriously wounded and unable to jump. Lt. Kingon showed great skill in landing the burning aircraft, and superb courage in rescuing both gunners. After dragging the gunners 100 yards, he returned for the emergency water supply and first aid kit, although the aircraft was blazing and ammunition was exploding, and continued to give first aid treatment to his wounded companions until enemy troops arrived.

## Military Medal

A/C.1 H. L. BOWDEN, No. 651 Sqn.—One day in November, 1942, A/C.1 Bowden was left in charge of a section at an Advanced Landing Ground in N. Africa. Later in the day this Advanced Landing Ground had to be abandoned, and A/C.1 Bowden took his section with their weapons into the hills. Two hours later they returned, hoping to move their vehicle, but were driven off by machine gun fire. They returned at dark, and spent that night in their vehicle. Next day they were again forced to take to the hills by machine-gun fire, but in the afternoon decided to try to move the truck under cover of a move forward by some American tanks. The subsequent withdrawal of these tanks forced the section to take to the hills again, but A/C.1 Bowden decided to make another attempt, and returned with his men to the truck and extricated it under cover of darkness. Throughout this period A/C.1 Bowden has shown great powers of leadership, determination and devotion to duty in that he steadfastly refused to abandon his vehicle. The other men of his section loyally

supported him, and together they brought away the vehicle and all aircraft stores without any loss, though the vehicle was damaged by enemy fire.

# Roll of Honour

*Casualty Communiqué No. 214.*

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 27 are second entries giving later information of casualties published in earlier lists.

## Royal Air Force

KILLED IN ACTION.—Sgt. L. T. Adams; Flt. Sgt. A. J. Bedale; Flt. Sgt. A. D. S. Boult; Sgt. J. Buckland; Sgt. F. W. Calladine; Sgt. N. R. H. Campbell; Sgt. C. W. Darwin; Sgt. D. W. Davis; Sgt. R. F. Evans; Sgt. J. J. Griffin; F/O. D. M. Moss; Sgt. D. O. Walker; P/O. R. N. R. Wherrett; Sgt. B. J. Woodley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. V. Anderson; P/O. G. Baker; W/O. J. M. B. Black; Sgt. J. Dodds; Sgt. A. V. Kay; Sgt. H. Knight; Sgt. F. E. Lawson; Sgt. F. A. Murphy; Sgt. S. C. Preston; Flt. Sgt. A. J. Reid; Sgt. W. L. Taylor; P/O. J. D. F. Weet.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. H. Bradbrook; Sgt. F. G. Brown; Flt. Sgt. V. Carriline; Act. Flt. Lt. P. A. Dalton; Sgt. J. E. T. Foot; Wing Cdr. P. G. Heath; Sgt. W. R. Hunt; Flt. Lt. H. Liversidge; Sgt. L. S. Lloyd; Act. Flt. Lt. W. R. Maitland; Sgt. D. E. N. Scott; Sgt. F. Squires; Sgt. S. R. Stickney; Act. F/O. R. W. Valters; Sgt. J. H. White.

WOUNDED OR INJURED IN ACTION.—Sgt. A. Glover; Sgt. E. S. Lightley; Sgt. J. C. Trotman.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. W. Robinson.

MISSING, BELIEVED KILLED IN ACTION.—Cpl. J. Barnard; Sgt. V. F. Butcher; Sgt. J. L. Charlton; P/O. C. P. F. Cronin; Sgt. A. G. Daniels; Sgt. W. H. Darge; Flt. Sgt. R. C. Morris; Sgt. E. A. J. Nicholas; L.A/C. W. L. Purkiss; L.A/C. J. Savidge; Sgt. B. J. Ward; Sgt. L. J. Webber.

MISSING.—Sgt. J. D. Adam; Sgt. L. E. Austin; Sgt. W. K. Barton; P/O. E. A. Beckwith; P/O. M. K. Brett; P/O. R. G. Brinkworth; P/O. J. D. Brodie; Sgt. F. W. Cater; Sgt. F. A. Cavadino; Sgt. J. W. C. Clark; Sgt. J. Corke; Sgt. C. L. Davies; Sgt. L. Davies; Sgt. E. J. Dollard; Sgt. G. G. Ellis; Sgt. R. E. Elvin; P/O. P. F. Franklin; F/O. T. Franks; Sgt. P. N. Goalby; F/O. H. J. Godfrey; Sgt. W. G. Goode; W/O. R. M. Gray; Sgt. T. L. Gray; Flt. Sgt. H. C. Griffin; P/O. K. C. Hammond; Sgt. D. E. J. Hardy; Sgt. J. S. Hunter; Sgt. G. W. Jackson; A/C.2 K. R. James; Sgt. E. H. Johnson; Flt. Sgt. R. Johnson; Sgt. A. R. King; P/O. D. Llewelyn; F/O. G. H. McMillan; Sgt. J. B. A. McPherson; Sgt. R. Maddocks; Flt. Sgt. B. Marrows; Sgt. B. Martin; Sgt. R. F. Mathews; Sgt. W. R. Maunder; Sgt. A. Mitchell; Sgt. H. V. Moorshead; P/O. F. Noon; P/O. E. Payling; L.A/C. H. S. Phillips; F/O. J. K. A. Pickering; Sgt. D. B. Pollitt; Sgt. N. Pringle; Sgt. L. H. Richardson; Sgt. G. F. Roberts; Sgt. J. Rostron; P/O. T. C. Roux; Sgt. R. Sharp; Sgt. A. C. Spear; P/O. E. J. Stanton; Sgt. W. F. Thompson; Flt. Sgt. H. Watts; Sgt. S. H. J. White; Sgt. R. S. Williams; Sgt. H. Woodrow; P/O. R. G. Woods.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. R. M. McCreadie; L.A/C. W. R. B. Stoddart; L.A/C. S. W. Tye.

KILLED ON ACTIVE SERVICE.—Sgt. G. J. Abrey; Sqn. Ldr. D. E. W. Adamson; Sgt. N. Allison; Sgt. R. W. Almond; P/O. J. G. Beck; P/O. R. I. Bernstein; P/O. G. E. Brooke-Turner; Cpl. S. Burns; L.A/C. D. R. Clandillon; L.A/C. J. A. Clay; L.A/C. S. Cliff; Sgt. A. J. Cook; Sgt. J. D. Cooper; P/O. P. D. Corlett; Cpl. C. Costello; Flt. Lt. L. G. Dennis; P/O. P. N. Dix; Sgt. A. R. Eastbury; Sgt. K. W. Y. Fison; Sgt. A. D. Hammond; Sgt. D. L. Harris; Flt. Lt. R. H. Hillary; Sgt. W. S. Hogg; Sgt. J. C. W. Hook; Cpl. L. Jenkins; L.A/C. A. Leder; Sgt. D. A. Lowman; L.A/C. D. A. McAuley; F/O. F. McNally; Sgt. C. B. Morris; F/O. K. R. J. Pennington; Sgt. W. Perkins; W/O. J. R. Phillipson; Sgt. G. Ruemiller; P/O. R. V. Say; P/O. W. Singer; Sgt. T. M. Slattery; Sgt. H. Smith; A/C.2 R. Smith; Sqn. Ldr. B. E. Smith-Rewse; Sgt. R. G. A. Styles; P/O. L. A. Tramson; A/C.1 W. F. Tribe; Sgt. R. A. F. Turnbull; F/O. A. E. Tyler; Sgt. A. G. Walters; P/O. J. A. C. Watts; Sgt. T. Whitelock; Sgt. R. P. Wightman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. H. D. Bryson; Cpl. J. D. Coad; L.A/C. F. Foster; A/C.1 J. Hutchinson; L.A/C. T. O. Jones; L.A/C. C. S. Rees; F/O. C. F. Strutt.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. C. G. Prest.

DIED ON ACTIVE SERVICE.—L.A/C. E. G. E. Allen; L.A/C. J. Ball; L.A/C. G. A. F. S. Barden; L.A/C. R. S. Hegan; W/O. W. McKee; L.A/C. S. W. Miller; P/O. E. H. Towner; Cpl. P. F. Webling; L.A/C. L. F. Williams.

## Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/CW.2 G. M. Allsop; A/CW.2 B. D. Austen; A/CW.2 E. D. Finch; A/CW.2 B. J. Hutt; A/CW.2 M. M. Piesse; Cpl. P. J. Pink; A/CW.2 M. J. Savage; Cpl. J. M. E. Standing.

**Air Vice-Marshal T. L. Leigh-Mallory, A.O.C. in C. Fighter Command, talking with liaison officers at a forward airfield in the big invasion exercises.**

DIED ON ACTIVE SERVICE.—A/CW.2 H. G. Chapman; A/CW.2 E. N. Maxley.

## Royal Australian Air Force

KILLED IN ACTION.—F/O. R. H. Holcombe; P/O. I. S. H. Palmer; Sgt. R. C. Payne; Sgt. W. J. T. Watson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. E. Guy.

MISSING, BELIEVED KILLED IN ACTION.—P/O. L. S. Clayton; F/O. R. W. Meaton; P/O. K. W. Paul.

MISSING.—Sgt. J. K. Bond; Flt. Sgt. W. G. Burrows; Sgt. D. J. Lindsay; Sgt. S. E. Logue; Flt. Sgt. C. McD. Miller; P/O. F. H. Mitchell; Flt. Sgt. D. C. Morphett; Sgt. H. F. Muller; Sgt. R. B. Mullinger; Flt. Sgt. A. F. Neale; Sgt. F. Proctor; Sgt. N. G. Smith; P/O. K. B. Walter; P/O. K. A. C. Weaving.

KILLED ON ACTIVE SERVICE.—Sgt. L. S. Cubitt.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. L. E. Doust; Sgt. J. Philip.

## Royal Canadian Air Force

WOUNDED OR INJURED IN ACTION.—Sgt. T. J. Thurgood.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. M. J. Dean.

MISSING.—Sgt. J. C. M. Desrosiere; Sgt. B. M. Harvey; P/O. W. D. B. Marks; Sgt. J. Perry; Flt. Sgt. J. V. Rounsefell; Flt. Sgt. A. Storey; W/O. C. N. Valequet.

KILLED ON ACTIVE SERVICE.—Sgt. C. C. Blamey; P/O. F. D. Drake; P/O. R. P. Frayn; F/O. W. M. Harris; F/O. R. L. R. Hepburn; Sgt. S. J. McCammon; P/O. W. O. McLean; W/O. K. M. Miller; Sgt. J. Munro; Sgt. K. F. Ray; Sgt. J. Shulman; Sgt. R. F. Wilkins.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. H. Aldridge.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. F. H. Carr.

## Royal New Zealand Air Force

WOUNDED OR INJURED IN ACTION.—Sgt. P. C. Fisher.

MISSING.—Act. Flt. Lt. S. D. L. Hood; Sgt. N. A. Plummer; Sgt. W. H. Sloan; P/O. L. J. Waterhouse; Sgt. E. B. Withell.

KILLED ON ACTIVE SERVICE.—Sgt. W. A. L. Babington; Sgt. R. Clark; F/O. J. S. Newcomb.

## South African Air Force

KILLED IN ACTION.—Act. Flt. Sgt. J. R. Gibbons.

WOUNDED OR INJURED IN ACTION.—Lt. J. Sadler.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Lt. E. B. C. Lahner.

KILLED ON ACTIVE SERVICE.—2/Lt. E. J. Cowlin; P.P. E. W. Game; Lt. E. L. Hazeldine.

## Indian Air Force

KILLED ON ACTIVE SERVICE.—F/O. Singh Gajinder.

## *Casualty Communiqué No. 215*

Of the names in this list 41 are second entries giving later information of casualties published in earlier lists.

## Royal Air Force

KILLED IN ACTION.—P/O. W. Fisher; Flt. Sgt. R. Spencer.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. K. O. Bowers; Sgt. W. H. Curtis; Sgt. E. A. Giles; Sgt. G. C. Hyde; P/O. S. McHugh; Sgt. K. H. Reddish.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. Everitt; Sgt. R. J. G. Fairweather; P/O. R. L. W. Ferrer; Sgt. J. C. Higham; Sgt. V. C. Howick; F/O. C. K. Parkes; Sgt. R. Peel; Sgt. D. J. Raynes; Sgt. E. A. Samuel; Sgt. A. Squires.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. W. Adams; Sgt. M. J. Boyle; Sgt. P. Brogan; Sgt. A. C. Burgess; Sgt. I. K. Crawford; Sgt. E. Fish; Sgt. H. I. Goodwell; Sgt. C. E. Hollingworth; Flt. Lt. L. H. Hunt; Sgt. W. T. McLennan; Sgt. P. F. Newman; Flt. Sgt. R. Owen; Sgt. W. Scobie; Sgt. A. Smith; Sgt. R. Wardrop.

MISSING.—Sgt. S. Allen; Sgt. W. Barrett; Sgt. J. A. M. Bell; Act. Sgt. J. L. Bell; F/O. P. M. Bellinger; Sgt. R. D. Bradbury; Sgt. R. Calcutt; P/O. A. G. Cameron; P/O. G. A. Clegg; Sgt. A. R. A. Colonna; Sgt. E. Cooper; Sgt. M. J. Crowley; F/O. S. P. Davis; Air Comdre. D. H. De-Burgh, D.F.C.; F/O. P. M. Dunne; Sgt. P. S. Fisher; Sgt. E. J. C. Florey; F/O. J. E. Foli-Brickley; Sgt. R. E. Gladwish; F/O. W. R. Y. Guilfoyle; Sgt. K. Hall; Flt. Sgt. F. Halliday; Sgt. R. E. R. Harries; P/O. C. Heywood; Sgt. J. W. Humphries; Sgt. S. Hunt; Sgt. J. Hutchinson; Sgt. J. J. Kellett; Flt. Sgt. J. Kiernan; P/O. O. T. P. King; Sgt. V. Lawrence; Sgt. J. H. Lightfoot; F/O. T. Lonsdale; Flt. Lt. J. M. Macdonald; Sgt. M. McKenzie; Sgt. E. C. Mantell; Flt. Sgt. C. Mather; Flt. Sgt. E. A. Meadwell; Sgt. C. P. Mitchell; Sgt. G. Mitchell; Sgt. D. B. Mogg; Sgt. R. H. Morris; Flt. Sgt. H. W. Morton; F/O. E. A. Mould; F/O. F. A. S. Patterson; Sgt. R. D. Perkins; Flt. Sgt. R. G. Peters; P/O. J. G. D. McC. Rawden; Sgt. J. J. Redmond; Sgt. H. Riles; Sgt. R. E. Sackville-Golden; Act. Flt. Lt. A. T. Sprosen; P/O. N. C. Shattock; Sgt. M. W. Stephenson; Act. Sqn. Ldr. I. C. Strutt; Sgt. J. W. Urquhart; Sqn. Ldr. L. T. Wallis; Sgt. C. C. Webb; Sgt. S. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. D. Hunter.

KILLED ON ACTIVE SERVICE.—P/O. H. B. Bell; Flt. Sgt. J. G. Benson; Sgt. R. Britto; Sgt. D. Bullock; L.A/C. J. D. Cole; P/O. J. G. Curtis; Sgt. V. R. Day; L.A/C. W. V. Edmondson; W/O. F. L. B. Ellis; P/O. F. L. Farla; P/O. R. J. Frost; P/O. N. Gorick; L.A/C. L. Greenhalgh; Sgt. F. H. Hilling; Sgt. G. L. Hosford, G.M.; Sgt. C. Hoy; L.A/C. M. L. Kidd; Flt. Lt. W. L. King; Sgt. K. Lawson; Flt. Sgt. G. F. D. Lowrison; L.A/C. C. Manderfield; Act. Cpl. H. T. Mills; Flt. Sgt. W. Mossop; P/O. M. J. H. Newman; Sgt. W. Nichol; Sgt. J. O'Donnell; Sgt. J. S. Orr; Sgt. A. H. Perkins; Sgt. R. R. Phillips; Sgt. K. Plumtree; Sgt. R. W. A. Quin; Sgt. C. B. Ridge; Flt. Lt. F. H. Salt; Sgt. J. E. Slade; Sgt. W. Stanfield; Act. Flt. Lt. A. Stephenson; L.A/C. M. Voss; Flt. Sgt. G. Wartnaby; Sgt. R. Waugh; Sgt. J. W. Wellington; F/O. W. J. Wright; Sgt. D. W. Yates.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.1 P. V. Bergin; F/O. J. S. Boucher; P/O. M. A. Clancy; Cpl. V. Handman; Sgt. L. T. Knee; Sgt. J. Welsh; P/O. J. E. Whitehead; Sgt. W. J. Wonnacott; Sgt. C. W. Wyer.

DIED ON ACTIVE SERVICE.—Cpl. J. A. Andrew; L.A/C. H. Casparius; A/C.1 O. R. Coomber; Cpl. W. W. Cooper; L.A/C. A. D. Cox; A/C.1 E. S. Cubbon; A/C.2 A. P. Davies; Cpl. E. Dodds; L.A/C. T. L. Evans; L.A/C. W. Fisher; Sgt. N. K. Ford; Sgt. J. G. Girdler; L.A/C. J. F. Gleeson; P/O. E. E. H. Hall; A/C.2 J. R. Haynes; Cpl. J. E. S. Heeson; Act. Cpl. G. C. Jamieson; L.A/C. C. T. Jones; Sgt. R. Kenyon; Sgt. J. H. Medlyn; Act. Flt. Lt. T. W. Pearson; A/C.2 F. J. Robson; A/C.2 J. Ross; Act. Sqn

# SERVICE AVIATION

Ldr. C. T. E. Smith; P/O. H. B. Smith; L.A/C. R. Strachen; L.A/C. C. H. J. Tipper; Cpl. A. Yates-Dutton.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. W. J. Antonia; Sgt. A. Arnot; Flt. Sgt. W. E. Hornby; Sgt. J. McPherson; Sgt. A. Towndrow; Sgt. W. H. Watkins.

## Royal Australian Air Force

MISSING.—P/O. K. J. Bennett; Sgt. H. V. Lamb; W/O. A. R. Noseda; Sgt. G. A. O'Keefe; P/O. L. E. Reeve; P/O. W. T. W. Smithson; Sgt. E. F. Stack.

KILLED ON ACTIVE SERVICE.—Sgt. L. Badger; Sgt. G. W. Lowther; Sgt. J. L. McGrath; P/O. C. J. Stower; Sgt. T. S. Tamblyn.

## Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. G. Barclay; Flt. Sgt. D. G. Barrie; Sgt. H. R. Copeland; P/O. R. D. Flitton; P/O. W. A. Hayworth; Sgt. L. H. Jones; Sgt. J. C. McPherson; Sgt. A. O. Mireau; Sgt. I. MacL. Reid; P/O. A. D. J. Salt; Flt. Sgt. A. H. Winters.

WOUNDED OR INJURED IN ACTION.—Sgt. E. E. Wertzler.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. B. Featherstonaugh; Sgt. L. C. King; Sgt. J. E. R. Lavigne; Sgt. D. Mann; Sgt. J. W. Smith; Sgt. A. W. Wilson.

MISSING.—Sgt. F. H. Barker; Sgt. W. D. Cameron; Flt. Sgt. H. A. Dunn; Flt. Sgt. H. G. Dyer; Sgt. R. C. Fenton; Sgt. A. D. Foote; Sgt. R. T. Hambidge; Sgt. H. A. Horton; Flt. Sgt. V. A. Hugli; Flt. Sgt. W. G. Murphy; Sgt. M. J. Paige; Sgt. D. H. B. Powell; Sgt. A. M. Wark; Sgt. D. A. Watson; Sgt. S. V. Woyce; Flt. Sgt. J. N. Yudell.

KILLED ON ACTIVE SERVICE.—Sgt. H. K. Adams; P/O. R. M. Adams; Sgt. B. H. Barber; F/O. H. Brooks; Sgt. R. J. Haag; Flt. Sgt. H. Hare; F/O. W. B. Mosley; Sgt. D. L. Moulds.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. R. D. J. Macdonald.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. A. W. Paynter.

## Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. H. G. Clothier; F/O. J. R. F. Ganderton; P/O. T. H. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. H. Butler-Williams; Sgt. G. A. Young.

MISSING.—Flt. Sgt. D. T. Ray; Sgt. E. A. Sisson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. L. K. Guthrie.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. J. S. S. Adams; Sgt. C. W. R. McFarquhar.

## South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. A. J. Cooper.

MISSING.—2/Lt. B. W. Young.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. P. Martin; Capt. P. C. Vivian.

## Indian Air Force

KILLED IN ACTION.—P/O. M. C. S. Belekar.

DIED ON ACTIVE SERVICE.—E. F. Charan Singh.

## *Casualty Communiqué No. 216*

Of the names in this list 19 are second entries giving later information of casualties published in earlier lists.

## Royal Air Force

KILLED IN ACTION.—Sgt. E. M. Croft; Sgt. A. I. Davies; F/O. P. J. Hill; Sgt. M. F. Kenny; Sgt. F. L. Mills; F/O. M. S. Morris; Sgt. E. S. Moss; Sgt. P. D. Olley; Sgt. F. E. J. Orchard; Sgt. C. H. W. Phillips; Sgt. F. S. T. Pittard; F/O. W. J. Rees; F/O. F. Ridley; Sgt. J. R. Terry; Sgt. W. C. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. W. B. Brown; Sgt. J. R. Dryden; Flt. Sgt. R. J. Horlock; Sgt. A. McLeod; Sgt. C. M. Parker; Act. Flt. Lt. T. E. Salazer, D.F.C.; Sgt. J. Waddell.

WOUNDED OR INJURED IN ACTION.—Sgt. W. E. J. Harris.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. A. B. Grigor.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. F. Barber; Sgt. T. P. Bowles; F/O. L. V. Carrington; Flt. Sgt. S. R. Colbert; Sgt. V. J. M. Donaldson; Sgt. T. G. Hesketh; Sgt. A. Jacobsen; Sgt. D. Richardson; Sgt. R. E. Roberts; Sgt. G. Roe; F/O. P. G. Solon; Sgt. J. Webber; F/O. R. D. Woods; Sgt. D. Wright.

MISSING.—Sgt. L. G. Alexander; Flt. Sgt. F. W. Baker; Sgt. G. C. Baker; Sgt. W. H. Brunning; Flt. Sgt. W. J. Bryan; P/O. J. C. A. Clarke; Sgt. W. Cotton; Sgt. D. S. Coy; Sgt. P. Davey; P/O. F. H. Dinnage; Sgt. W. D. Dorey; Sgt. G. Geogge; P/O. C. J. J. Gill; Sgt. A. J. Glover; Sgt. C. Herbert; Sgt. G. D. Hester; Sgt. P. J. H. Hogg; Sgt. P. L. Houser; Sgt. G. J. Hunt; Flt. Lt. R. A. Jackson; Sgt. H. E. Johnson; Sgt. J. Johnson; Flt. Lt. J. G. Johnston; P/O. A. W. Lane; Sgt. J. Langrell; Sgt. H. V. Le Dieu; Sgt. D. St. J. Lidiard; P/O. L. G. Littell; Sgt. V. Loar; Sgt. A. J. Long; Sqn. Ldr. D. G. Long; D.F.C., A.F.C.; Sgt. N. Marshall; Sgt. G. E. Marwick; Sgt. E. L. Moore; Sgt. W. F. O'Beirne; Sgt. S. V. Ramsay; P/O. E. Rasmussen; P/O. F. C. Reed; Sgt. A. E. Rew; Sgt. A. A. Richardson; F/O. E. W. G. Rosam, D.F.C., D.F.M.; F/O. A. G. H. Rouse; F/O. F. B. Samuel; Sgt. F. H. Saunders; Flt. Lt. C. J. Simmonds; F/O. L. J. Skinner; Sgt. F. Spurr; P/O. G. H. Stead; Sgt. R. Stone; Sgt. P. J. C. Thomas; Sgt. E. H. Tucker; Sgt. M. P. Vaughan; Sgt. G. E. Watts; F/O. L. A. West; Sgt. R. Wrigglesworth.

KILLED ON ACTIVE SERVICE.—Sgt. J. Amos; F/O. A. R. Atkins, D.F.M.; Sgt. D. L. Baker; Sgt. K. R. Blaskey; P/O. C. D. Brown; W/O. R. J. Buckmaster; P/O. J. P. Butler; P/O. A. Cameron, D.F.M.; Act. Wing Cdr. J. G. Campbell; Sgt. J. Clark; Flt. Lt. J. H. Clark; F/O. W. E. Copp; P/O. L. A. Coughlan; Sgt. J. R. Craven; Sgt. J. G. Crummey; L.A/C. S. A. De'Ath; Sgt. R. E. Drago; Act. Sgt. G. M. Ellwood; Act. Wing Cdr. A. W. M. Finny; Act. Sgt. L. W. Fletcher; Flt. Sgt. W. G. Gilpin; Sgt. T. Harrower; Sgt. R. C. Havelock; Sgt. E. Highfield; Sgt. W. E. Hopkins; Sgt. N. Hurst; Sgt. H. J. Huxham; P/O. C. G. Kennerley; Sgt. J. Kerr; Sgt. T. G. Knope; Flt. Lt. A. W. Lane; Sgt. S. A. Langley-Ellis; Sgt. R. S. J. Linter; Sgt. J. F. H. Mahony; Sgt. A. V. Marshall; Sgt. E. A. Merry; P/O. W. W. Milson; L.A/C. F. Morris; L.A/C. T. W. Owen; A/C.1 C. E. Packer; L.A/C. G. H. Pallen; Sgt. D. A. Pauling; P/O. T. A. Perry; Sgt. A. C. Poulton; P/O. S. J. Powell; Sgt. J. H. Renshaw; P/O. J. J. Robinson; Sgt. R. G. Rouse; Sgt. D. Ryan; Sgt. S. Smith; Sgt. J. D. Stone; W/O. G. Sunley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. R. W. Apps; L.A/C. F. T. Davey; L.A/C. J. Gregory; A/C.1 J. C. Hilditch; Sgt. J. Hill; A/C.2 R. H. Jaques; Sgt. G. L. Johnson; L.A/C. A. W. Rouse; L.A/C. J. T. P. Sharpe; A/C.2 S. T. Watson; Sgt. T. A. Williams.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Act. Flt. Lt. H. W. Aves; L.A/C. W. Entwistle; Sgt. E. Greenwood; Sgt. L. A. Smith; Flt. Lt. P. E. Thornton-Bassett.

DIED ON ACTIVE SERVICE.—A/C.1 R. C. E. Boak; Cpl. D. Dewar; L.A/C. A. Green; A/C.1 P. J. Henegan; Cpl. W. F. Jemmett; L.A/C. R. T. MacFarlane; L.A/C. T. T. McLaren; L.A/C. G. P. Mould; F/O. L. A. F. Newman; L.A/C. S. F. Stedman; Cpl. R. W. Tebbutt; Cpl. W. J. Watson; A/C.1 C. White.

## Royal Australian Air Force

KILLED IN ACTION.—Sgt. J. A. G. Browne; Sgt. E. L. Cole; Sgt. L. Grey; Sgt. J. D. May; P/O. G. W. Rose.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. T. S. Gaffney.

WOUNDED OR INJURED IN ACTION.—F/O. T. L. Russell.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. A. Smithers.

MISSING.—Sgt. D. C. Bell; Sgt. R. F. Cripps; P/O. J. A. Frazer; P/O. B. W. Kearney; Act. Flt. Lt. W. D. Leek; F/O. R. A. Moyle; Sgt. J. C. Smithson; Sgt. G. M. Waldie.

KILLED ON ACTIVE SERVICE.—Sgt. C. B. Berger; Sgt. J. S. Eccles; Sgt. L. J. Hughes; Sgt. I. R. McDonald; Sgt. R. R. F. Swords; Sgt. W. B. Wearne.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. F. J. Irvine; Sgt. R. McG. Laurie.

## Royal Canadian Air Force

KILLED IN ACTION.—Sgt. R. Marsden.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. G. Dusten; Flt. Sgt. F. D. Lindsay.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. E. Alcazar; Flt. Sgt. E. W. K. Baker; Sgt. L. N. Dearlove; P/O. R. A. C. Draper; Sgt. A. G. McFee; Flt. Sgt. R. P. Shannon; F/O. K. White.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. W. G. Clark.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. A. Gillen; Sgt. W. S. Hignell; Flt. Lt. J. A. Rae.

MISSING.—P/O. C. J. Bennett; Flt. Sgt. J. E. Bradley; Flt. Sgt. J. A. Buick; F/O. E. W. Cunningham; F/O. E. J. F. Dunand; Sgt. C. A. Dunphy; P/O. G. D. Fitzgibbon; Sgt. S. J. Gergley; Sgt. C. W. Hollingshead; F/O. E. G. Kendel; P/O. H. B. Kent; Sgt. J. J. Lemke; Act. Flt. Lt. R. H. Lowe; Sgt. I. G. McLeod; Flt. Sgt. H. M. Magder; Sgt. D. C. Marshall; Sgt. A. G. Olson; Sgt. L. W. Phillips; Sgt. C. J. Smith; Sgt. W. W. Wallace; Flt. Sgt. R. H. Welsh.

KILLED ON ACTIVE SERVICE.—Sgt. J. A. R. T. Auclair; Sgt. J. H. A. Beliveau; Sgt. W. A. Boundy; Sgt. D. A. Brand; Sgt. W. E. Douglass; Sgt. M. P. Fahey; Sgt. G. L. Hall; Sgt. J. L. McConnell; Sgt. G. J. Raby; Sgt. B. E. Samuels; Sgt. D. B. E. Skinner; P/O. E. McL. Tew; P/O. G. Weston; F/O. G. Wood.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. E. R. H. Y. Lefebvre; Sgt. H. McGeach.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. J. R. Askew.

## Royal New Zealand Air Force

KILLED IN ACTION.—F/O. P. L. Sainsbury.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. S. Warlow.

KILLED ON ACTIVE SERVICE.—Sgt. G. H. Brookes; F/O. G. A. Faris; Sgt. L. B. George; P/O. R. H. Tye.

## South African Air Force

KILLED ON ACTIVE SERVICE.—Lt. C. D. Lovemore.

## Official Corrections

*To Casualty Communiqué No.* 212.

Under "MISSING," for Sgt. N. B. Q. Stevenson read Sgt. N. B. Q. Steevenson; also delete Sgt. I. D. Drysdale and Sgt. T. J. W. Wilcox. Under "KILLED ON ACTIVE SERVICE," delete L.A/C. S. Clift. Under "WOUNDED OR INJURED ON ACTIVE SERVICE," delete A/C.1 J. Hutchinson, S.A.A.F.; under "MISSING," delete 2/Lt. J. F. van Ryneveld, R.A.A.F.; under "MISSING," delete Sgt. R. D. MacKenzie.

*To Casualty Communiqué No.* 213.

Under "MISSING," delete P/O. W. Burt, Sgt. J. D. Singleton and Sgt. D. H. Webster.

**An R.A. sergeant examining an enemy parachute supply container dropped during the Guards' battle for "Steam Roller Farm," in Tunisia.**